Jabil Digital DFx Content Extract

Design For Sustainability

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Design For Sustainability

1. General

1.1. General

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Entry ID: 1818

Sustainable Design - Plastics and Elastomers

Guideline

CID: 3	Content Owner: Jabil	Content Type: Requirement

For material selection guidance, see Entry 1844.

Avoid selecting PVC material.

- PVC currently has no means for recycling at end of life.

If feasible, select resins produced from a renewable bio-sourced feedstock.

- Renewable bio-sourced feedstocks are sourced from plants and microorganisms that absorb carbon during their lifetimes and are renewable, reducing the carbon footprint.

If feasible, select a hot runner system for the injection molding process.

- Cold runner injection molding processes produce more plastic waste than hot runner processes.

If feasible, select clear plastic instead of colored plastic.

- Clear plastic can be dyed any color when the product is recycled at end of life. Colored plastic would only be suitable for future products that are the same color.

Avoid selecting black plastic.

- Black plastic is almost never recycled because it cannot be dyed another color, making it less desirable. Standard sorting machines cannot sort black material well, so it may more frequently enter the unrecovered waste stream.

Related Entries

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Entry ID: 1819

Sustainability General Information

Information

CID: 1	Content Owner: Jabil	Content Type: Information

What is sustainability and why is it important?

Sustainability is focused on meeting the needs of the present without compromising the ability of future generations to meet their own needs.

We cannot maintain Earth's ecosystems, or continue to function as we do if more sustainable choices are not made. If harmful processes are maintained with no change, it is likely that we will run out of fossil fuels, huge numbers of animal species will become extinct, and the atmosphere will be irreparably damaged. Clean air and nontoxic atmospheric conditions, growth of resources that can be relied upon, and water quality and cleanliness, are all benefits of sustainability.

CID: 3	Content Owner: Jabil	Content Type: Information

Circular Economy Solutions

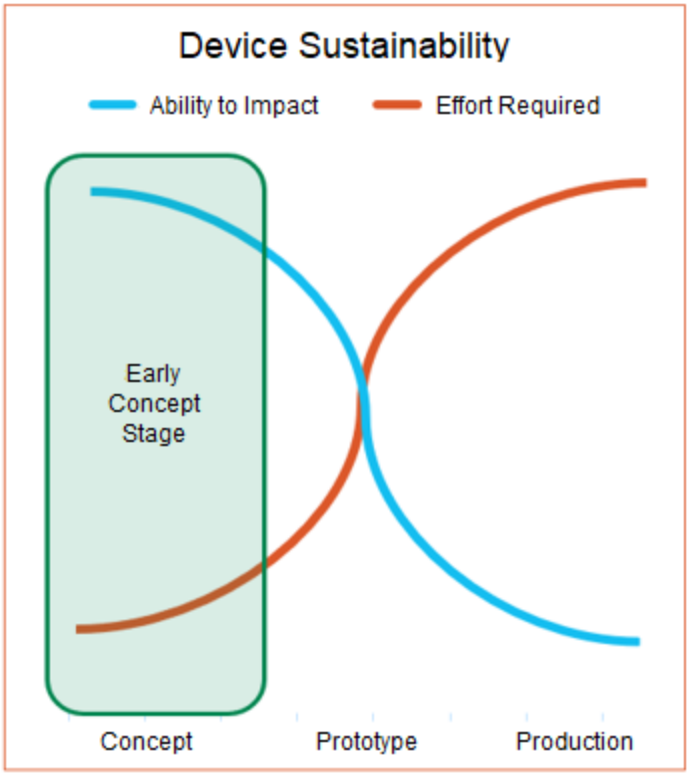
It is critical to start planning for a product's end of life from its earliest stages, before the product even exists. By starting at an early design phase, it's possible to be selective throughout the manufacturing process, from the materials to the assembly methods required, to ensure the most sustainable choices. Across all industries, from healthcare and automotive to retail and packaging, design principles like thoughtful material usage, modular design, and sustainable supply chain partners can help create circularity in the product lifecycle.

CID: 2	Content Owner: Jabil	Content Type: Information

Why designing for sustainability is important.

At design stage, the opportunity to optimize a product design for sustainability is at its peak through concept and material selection. Conversely, if sustainability is not considered at this stage, the chance to consider it at later stages is much reduced, becomes more complicated, and adds significant time and cost to the development lifecycle.

By intentionally designing for sustainability from the early stages and throughout the production process, it's possible to reduce contaminants and avoid materials that are difficult to remove for reuse and recycling, such as screws, bolts, and glue. Rethinking assembly processes to include materials like shape-memory resins for lighter, stronger, and infinitely more sustainable products is highly desirable. Additionally, designing with modularity in mind, a product's individual materials and components can be upgraded as newer technologies are developed. With modularity, the complete product can be more easily disassembled at the end of its life.



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Entry ID: 1834

Sustainable Design - Multi-Use

Guideline

CID: 3	Content Owner: Jabil	Content Type: Requirement

Ensure products are designed so they can be repaired with standard / widely available tools.

- If specialized tools are required to repair a product, a higher proportion of devices may enter the unrecoverable waste stream.

Ensure components that are susceptible to wear or damage are repairable or replaceable.

- If non-replaceable or non-repairable parts break, the product is more likely to be discarded.

Ensure materials chosen have sufficient durability for the expected life of the product.

- Some materials may be more susceptible to wear or degradation. More durable materials could allow the product to be refurbished or reused.

For parts of a product that are single use while the rest of the product is multi-use: ensure the single use pieces are easily replaceable.

- If the majority of a product is multi-use but only a portion is single use and non-replaceable, the entire product would have to be discarded after a single use.

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Entry ID: 1835

Sustainable Design - All Products

Guideline

CID: 3	Content Owner: Jabil	Content Type: Requirement

For material selection guidance, see Entry 1844.

Avoid selecting materials that meet the device functional requirements but have a higher carbon footprint.

- High carbon footprint materials produce a lot of CO2 during production, and can have a negative impact on the environment.

If feasible, choose supplier material / parts manufacturing locations that utilize a high proportion of renewable energy sources.

- Use of non-renewable energy sources has a high carbon footprint, and can negatively impact the environment.

If feasible, choose manufacturing locations that utilize a high proportion of renewable energy.

- Use of non-renewable energy sources has a high carbon footprint, and can negatively impact the environment.

If feasible, choose supplier locations that are a short distance from the chosen product manufacturing location.

- The longer distance a material is transported increases the carbon footprint generated.

If feasible, choose assembly manufacturing sites that are located in the intended market.

- The longer distance a product is transported increases the carbon footprint generated.

If feasible, select materials that are recyclable in the intended market location.

- Materials that aren't recyclable go directly into the unrecovered waste stream.

If feasible, select materials that have a high rate of recycling in the intended market location.

- Materials with a low rate of recycling are more likely to go into the unrecovered waste stream.

If feasible, avoid lubricants, solvents, paints, and other chemicals.

- Items such as lubricants, solvents, paints, etc. can contaminate the waste stream. Materials that may otherwise have been recyclable, can no longer be recycled due to exposure to these contaminants.

If feasible, select laser marking instead of printed marking.

- Ink, paint, etc. can contaminate a waste stream. Products that otherwise would have been recyclable, would no longer be recyclable due to the ink or paint on the product.

Perform a Life Cycle Assessment of the product per ISO 14001.

- Performing a life cycle assessment of building materials and components will asses the carbon footprint of the closed loop of manufacture, assembly, and disassembly of the product. This highlights areas in the product lifecycle that have a high carbon footprint and a negative impact on the environment.

If feasible for low volume manufacturing, design products that can be produced using the additive manufacturing process.

- Other manufacturing processes may result in more waste material or consume more power, increasing the carbon footprint.

If feasible, select recycled or bio-sourced synthetic fibers.

- Unrecycled synthetic fibers require more energy during the manufacturing process than recycled or bio-sourced synthetic fibers.

If feasible, select vendors that utilize recycled glass (cullet) in their process.

- Recycled glass reduces the amount of water and energy required during the manufacturing process.

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Entry ID: 1836

Sustainable Design - Metals

Guideline

CID: 2	Content Owner: Jabil	Content Type: Requirement

For material selection guidance, see Entry 1844.

Avoid selecting rare metals.

- Mineral mining for rare metals is an unsustainable process. The minerals can become exhausted before replenishment occurs through natural processes.

Avoid selecting heavy metals that are hazardous to the environment.

- Heavy metals release hazardous chemicals as they degrade.

If feasible, select aluminum or steel for as many metal parts as possible.

- Recycling saves 95% of the energy required to produce aluminum from raw materials. Aluminum and other non-ferrous metals can be melted down and reused almost indefinitely, without losing strength or reliability. Steel and other ferrous metals are durable and easy to retrieve in the recycling process due to their magnetic properties.

If feasible, select recyclable polymer parts instead of metal parts.

- The emissions from metal manufacturing, processing, and shipping greatly exceed that of polymers due to the metal's higher weight and required forming temperatures.

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Entry ID: 1837

Sustainable Design - Assemblies

Guideline

CID: 2	Content Owner: Jabil	Content Type: Requirement

Minimize the number of different materials in a product.

- A product with multiple types of material is more difficult to recycle, because the materials have to be separated into different waste streams.

If feasible, choose clips, press fits, and other attachment options instead of screws and bolts to fasten the pieces of a product together.

- Screws and bolts can make disassembly of the device more time consuming and expensive than clips and other attachment methods that are quicker and easier to disassemble. Time consuming disassembly procedures can reduce the viability of segregating components in a device for recycling, leading to reduced recycling rates.

If feasible, choose clips, press fits, and other attachment options instead of using adhesives or thermally bonding two materials that cannot be recycled together.

- Adhesives or thermally bonding two materials that cannot easily be separated, makes it more difficult to place in the appropriate recycling stream. Thermally bonding uses more energy than clips and press fits, increasing the carbon footprint for the product.

If feasible, combine multiple parts that are the same recyclable material into a single part.

- Multiple parts that would all go into the same recoverable waste stream but first must be dis-assembled are more difficult to recycle.

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Sustainable Design - Electronics

Guideline

CID: 2 Content Owner: Jabil Content Type: Requirement

Ensure circuitry allows regulators / high power consumption devices to be shut down, put into sleep mode with software, or auto-powered off.

- Regulator / high power consumption devices that can be shut down, put into sleep mode, or auto-powered off will reduce power consumption.

Ensure the product is Energy Star certified.

- Achieving Energy Star certification will help to reduce power consumption.

Ensure subassemblies can be separated easily from the primary assembly.

- Not designing for separation can make disassembly of the device more time consuming and expensive. Time consuming disassembly procedures can reduce the viability of segregating components in a device for recycling, leading to reduced recycling rates.

Ensure quick disconnect tubing is utilized.

- Quick disconnect tubing makes it easier to replace parts and may extend the life of the product. Quick disconnects will also make it easier to disassemble, increasing the likelihood it will be recycled.

If product reliability allows, ensure no-clean solder products are utilized for PCBA assembly of the product.

- No-clean solder eliminates the need for water wash and chemicals, reducing water consumption, and eliminating the need for chemicals that could harm the environment.

For refrigeration or heating products, ensure there is an alarm if the door is left open.

- Including the circuitry and sensor for a door that is left open will reduce long term energy consumption.

Design for laser depaneling to maximize the utilization of panels / arrays.

- Laser depaneling reduces scrap / unused material.

Select PCB geometries that maximize the utilization of panels / arrays.

- Shapes that fit together such as rectangular PCBs can reduce scrap by allowing very close spacing, maximizing utilization of the panel / array.

Ensure the PCB FAB utilizes 100% of the array.

- Utilizing other parts of a PCB for a daughter card, or switch board, or connector board can increase utilization of the panel / array and reduce scrap.

Select geometries that allow combining PCBs with daughter cards, switch boards, connector boards, etc. into a single panel / array.

- Shapes may be easier to fit together if daughter cards, switch boards, connector boards, etc. are combined into a single panel / array with the primary PCB, maximizing utilization and reducing scrap.

Minimize the number of screws for attaching the PCB to the housing.

- Only one screw to mount the PCB improves ease of assembly / disassembly and reduces part count, simplifying the shipping / logistics, supply chain management, and reducing fuel consumption.

Ensure there are not multiple components with the same value but different tolerances.

- Utilizing the lowest tolerance part for all same value parts simplifies the shipping / logistics, supply chain management, and reduces fuel consumption.

If multiple parts have the same value but different component package types, select a single package type.

- Selecting a single package type that will work for all locations, versus multiple package types, simplifies the shipping / logistics, supply chain management, and reduces fuel consumption.

If feasible, design one PCB FAB with multiple variations utilizing populated versus de-populated components to create variations of a product family.

- This can reduce part count and simplifies the shipping / logistics, supply chain management, and reduces fuel consumption.

If feasible, allow X-outs in panels / arrays for PCB fabrication.

- If X-outs are allowed, the entire panel / array will not have to be scrapped. Not allowing a single PCB defect in the panel / array increases cost and scrap that would go into the unrecoverable waste stream.

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Entry ID: 1844

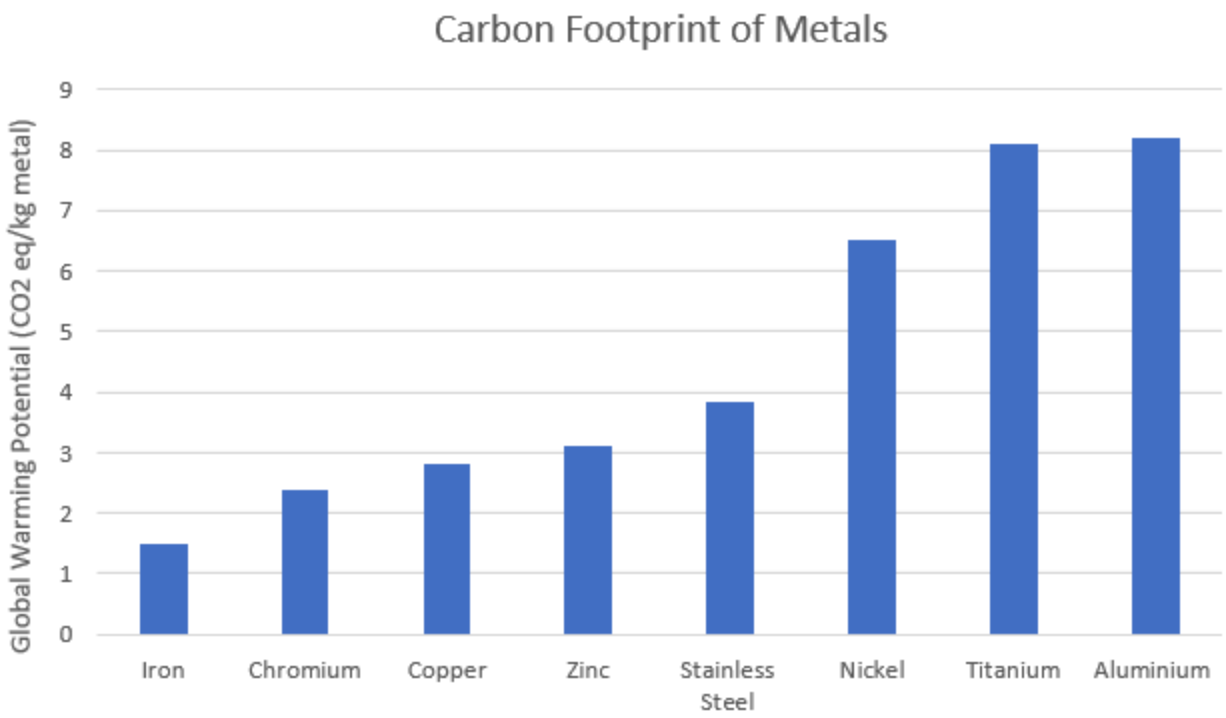
Sustainable Material Selection

Information

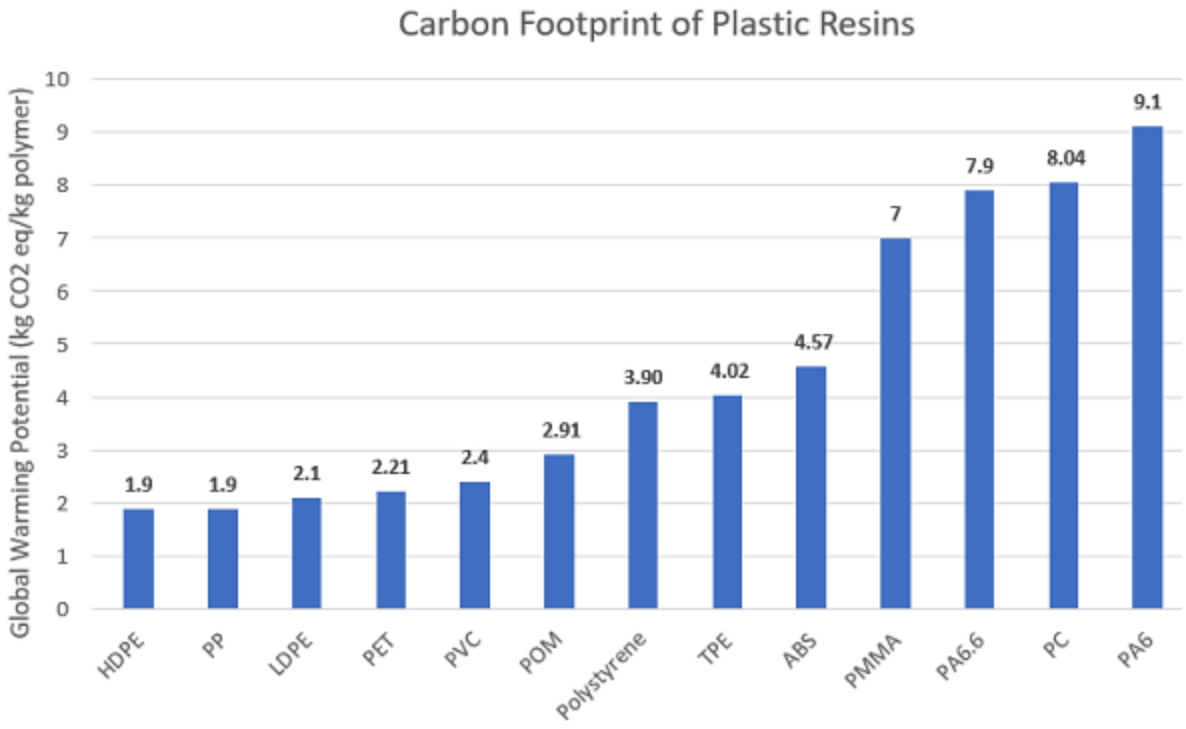
CID: 1 Content Owner: Jabil Content Type: Information

Different materials have a higher or lower carbon footprint. When selecting materials, the following should be taken into account.

Metals:



Plastics:



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