Using Okala Impact Factors

Okala Practitioner Chapter 12

Using Okala Impact Factors

We can use Okala impact factors to quantify the ecological performance improvement (or degradation) of a product design compared to another design.

In this presentation, we compare the impacts of an existing product to the impacts of the new product that has been redesigned with a specific ecodesign strategy.

Reference product: radio

Our reference product is a hypothetical radio. Its housing is made from high impact polystyrene (HIPS), it is manufactured in China and transported to North America by intercontinental air freight.

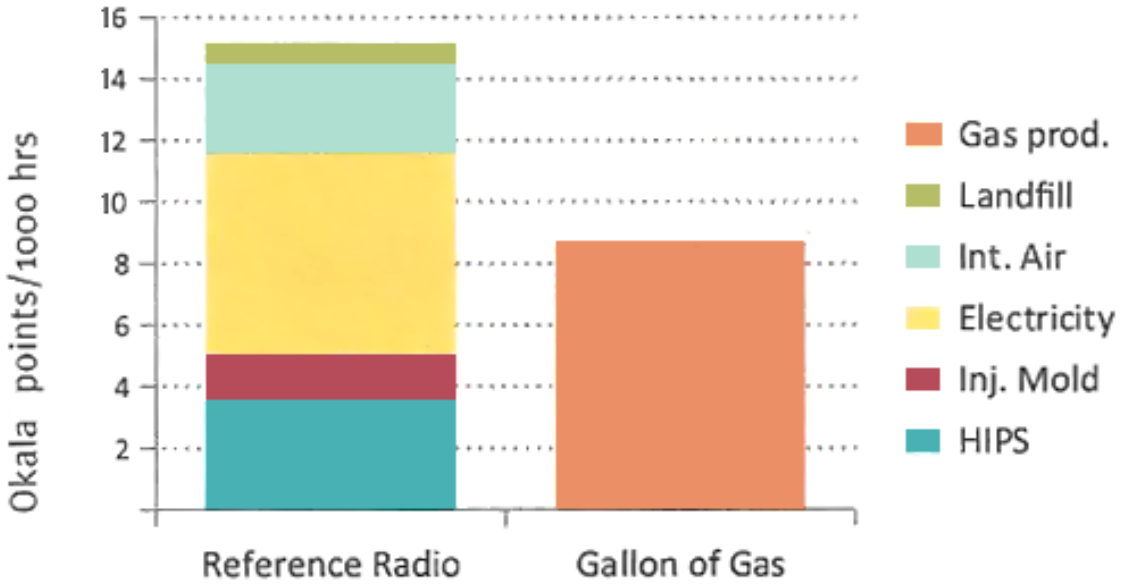
We assess impacts per 1000 hours, which in this case is also the product lifetime. For the sake of simplicity in demonstrating how to use ecodesign strategies with the impact factors, switches & electronics, cable, antenna and paper box are excluded.

Radio

The life cycle impacts of the elements in the radio are shown.

As a reference, these impacts are compared to the production impacts of one gallon of gasoline.

REFERENCE RADIO			Impact Factor	Impact
HIPS	2	lbs	1.8	3.6
Injection moldinmg	2	lbs	0.72	1.44
Electricity	6	kW-hrs	1.1	6.6
Intercontinental air	1.8	ton-miles	1.6	2.88
Landfill HIPS	2	lbs	0.35	.07
Okala impacts per 1000 hrs:				**15.22**



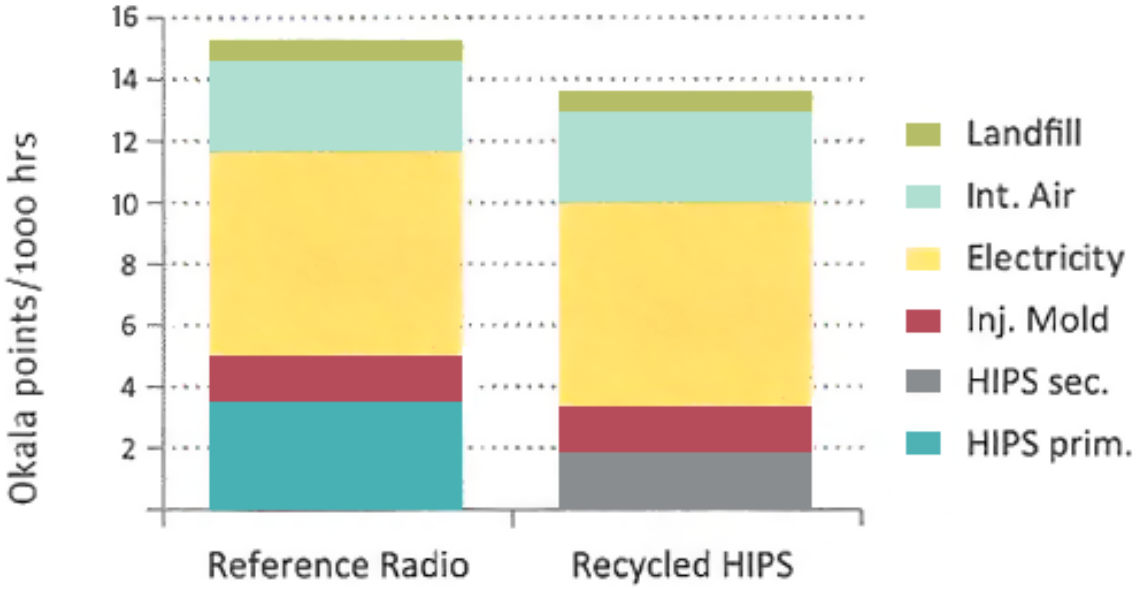
Example A.

Use recycled material

RECYCLED HIPS			Impact Factor	Impact
Recycled HIPS	2	lbs	1.0	2
Injection molding	2	lbs	0.72	1.44
Electricity	6	kW-hrs	1.1	6.6
Intercontinental air	1.8	ton-miles	1.6	2.88
Landfill HIPS	2	lbs	0.35	0.7
Okala impacts per 1000 hrs:				**13.62**

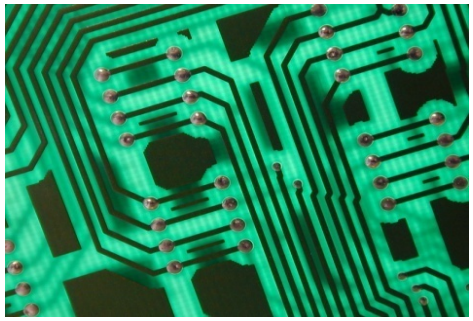
By replacing the primary polystyrene (HIPS) with secondary HIPS, we reduce the overall impact from 15.2 to 13.6 points,

an **11% reduction.**



Example B.

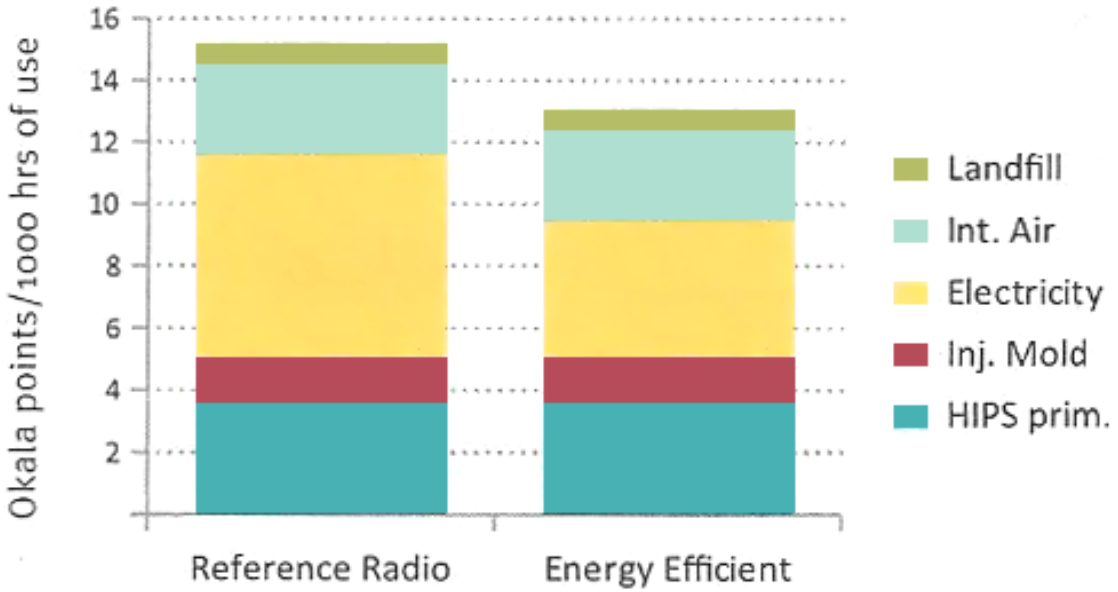
Increase energy efficiency



By improving the energy efficiency of the electronics in the radio, we reduce the electrical energy use from 6 kW-hr to 4 kW-hr, and we reduce the overall impact from 15.2 to 13.0 points,

a 13% reduction.

ENERGY EFFICIENT			Impact Factor	Impact
HIPS	2	lbs	1.8	3.6
Injection molding	2	lbs	0.72	1.44
Electricity	4	kW-hrs	1.1	4.4
Intercontinental air	1.8	ton-miles	1.6	2.88
Landfill HIPS	2	lbs	0.35	0.7
Okala impacts per 1000 hrs:				13.02

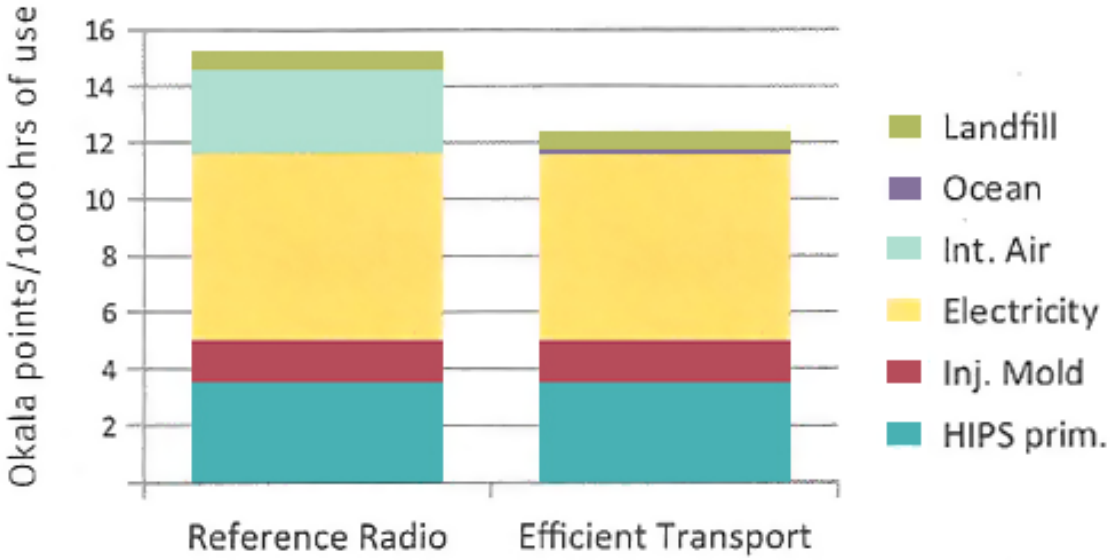


Example C.

Use efficient transport

By changing the mode of transport from intercontinental air freight to container ship, we reduce the impact from 15.2 to 12.4 points, **an 18% reduction.**

OCEAN TRANSPORT			Impact Factor	Impact
HIPS	2	lbs	1.8	2
Injection molding	2	lbs	0.72	1.44
Electricity	12	kW-hrs	1.1	14.4
Ocean freighter	1.8	ton-miles	0.053	0.09
Landfill HIPS	2	lbs	0.35	0.7
Okala impacts per 1000 hrs:				**12.43**

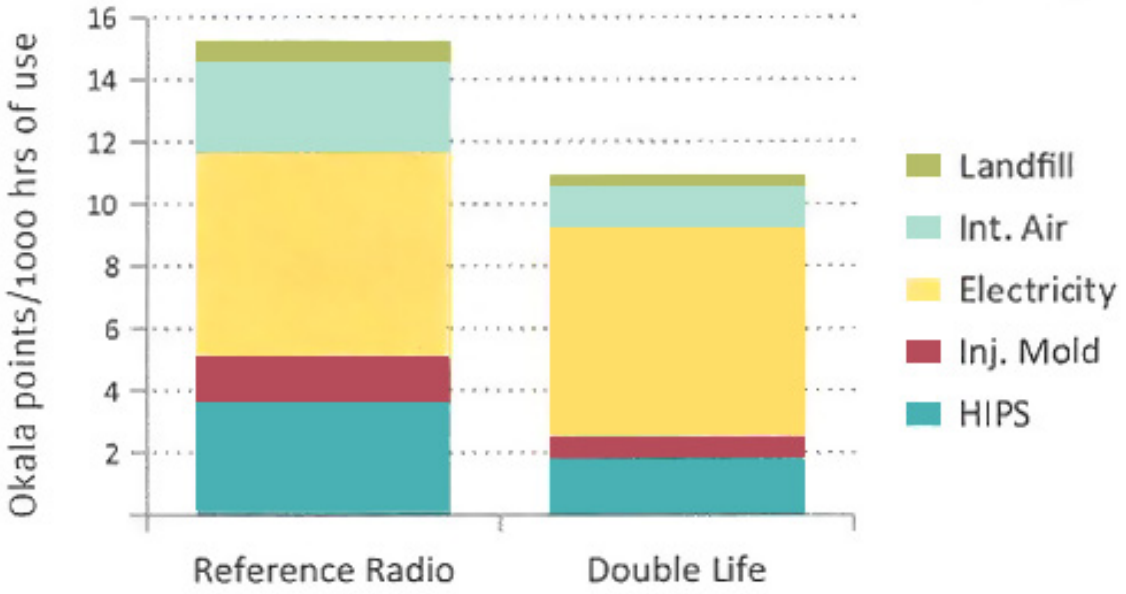


Example D.

Extend product life

By doubling the functional life of the product, the energy use per unit time stays constant, but the other factors decrease by 50%. We reduce impact per 1000 hours of use from 15.2 to 10.9 points, **a 28% reduction.**

DOUBLE LIFE			Impact Factor	Impact
HIPS	2	lbs	1.8	2
Injection molding	2	lbs	0.72	1.44
Electricity	12	kW-hrs	1.1	14.4
Intercontinental air	1.8	ton-miles	1.6	2.88
Landfill HIPS	2	lbs	0.35	0.7
Okala impacts per 2000 hrs:				**21.82**
Okala impacts per 1000 hrs:				**10.91**



Example E.

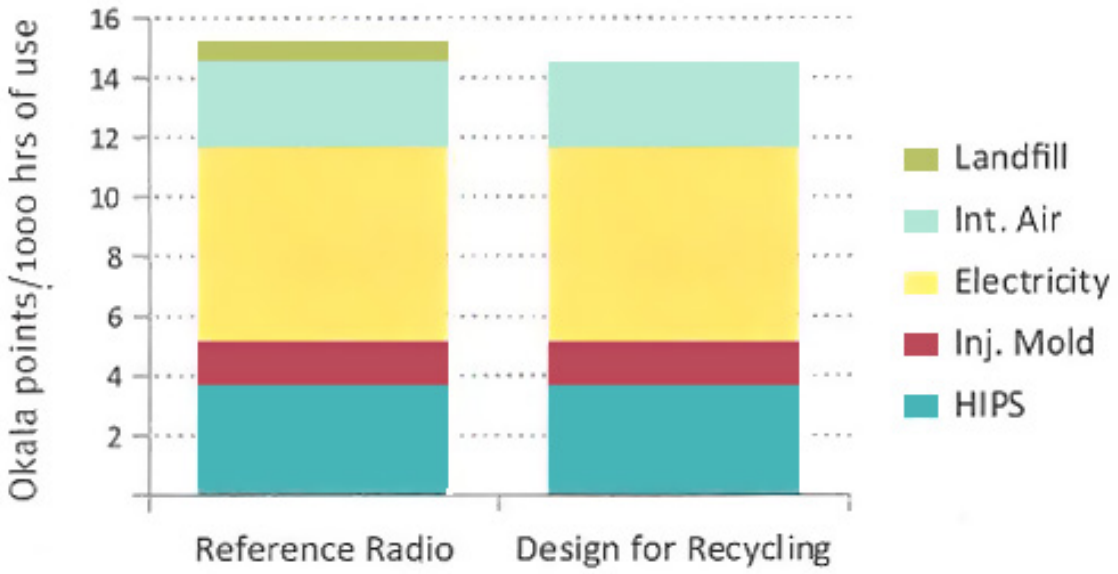
Design for disassembly and recycling

DESIGN FOR RECYCLING			Impact Factor	Impact
HIPS	2	lbs	1.8	3.6
Injection molding	2	lbs	0.72	1.44
Electricity	6	kW-hrs	1.1	6.6
Intercontinental air	1.8	ton-miles	1.6	2.88
Recycle HIPS				0
Okala impacts per 1000 hrs:				**14.52**

LCA practitioners strive to avoid "double counting", so we give credit for the recycling process to the secondary (recycled) material.

We move the impacts of the recycling process to the next product, and avoid the impacts of landfilling the HIPS.

This drops the overall impacts from 15.2 to 14.5 points,
a 5% reduction.



Example F.

Extrapolating impact factors

Designers often need a material that is not listed. In some cases it can be extrapolated from existing factors, following these guidelines:

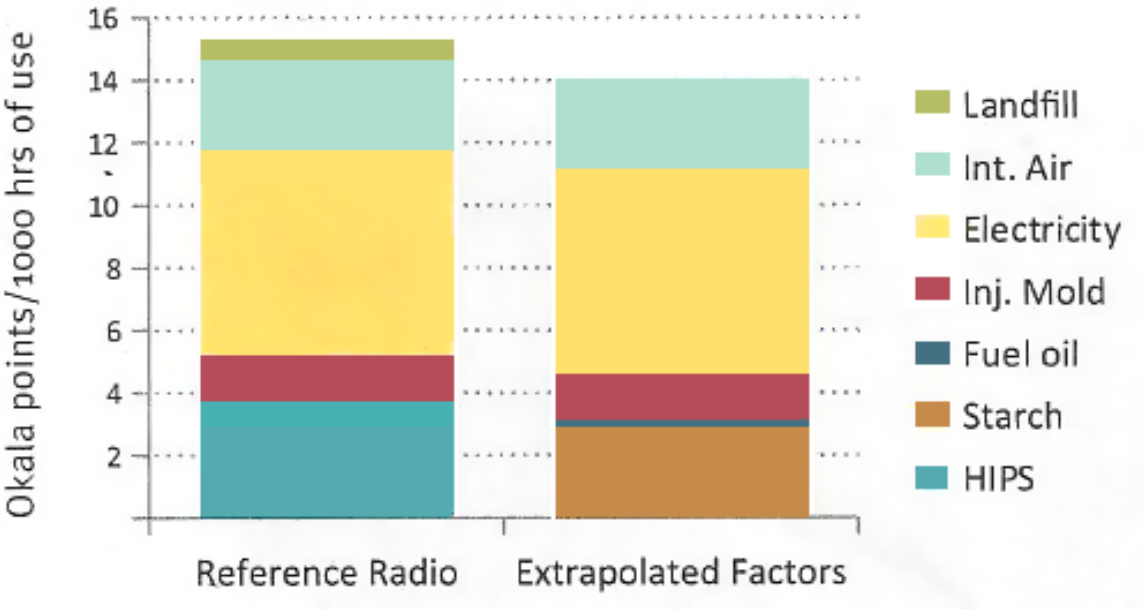
1. Clearly state that the factors are extrapolations.

2. Extrapolations are reasonable ratios of existing factor values.

In this imaginary example, making 2 lbs. of bio-plastic requires 2.2 lbs. of starch and 0.05 gallon of fuel oil. Composting impacts are zero. This dropped the overall impacts from 15.2 to 14.8,

a 3% reduction.

EXTRAPOLATE FACTORS			Impact Factor	Impact
Corn starch	2.2	lbs	1.3	2.86
Fuel oil	0.05	gallon	6	0.3
Injection molding	2	lbs	0.72	1.44
Electricity	6	kW-hrs	1.1	6.6
Intercontinental air	1.8	ton-miles	1.6	2.88
Landfill				0
Okala impacts per 1000 hrs:				**14.8**



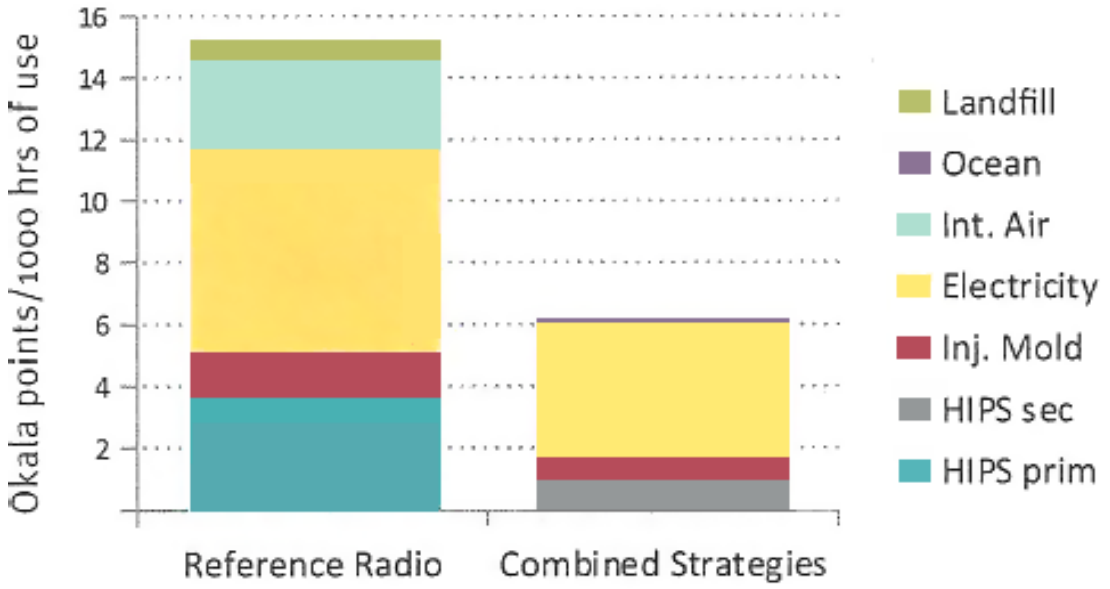
Example G.

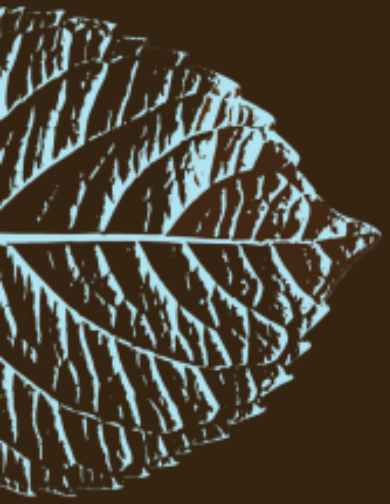
Combine strategies

By combining the strategies from examples A through E, we achieve a large reduction.

They add to 12.4 / 2 = 6.2 points, **a 59% reduction!**

COMBINED STRATEGIES			Impact Factor	Impact
HIPS sec	2	lbs	1.0	2
Injection molding	2	lbs	0.72	1.44
Electricity	8	kW-hrs	1.1	8.8
Intercontinental air	1.8	ton-miles	0.053	0.10
Landfill				0
Okala impacts per 2000 hrs:				**12.44**
Okala impacts per 1000 hrs:				**6.22**





Okala Practitioner

Integrating Ecological Design

This presentation is part of an educational presentation series that supports teaching from the *Okala Practitioner* guide.

Okala Practitioner and these presentations were created by the Okala Team to disseminate fact-based knowledge about ecological design to the design disciplines and business.

Unless provided in the presentation, Information sources are found in the *Okala Practitioner* guide.

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The Okala Team initiated the collaboration with the US EPA and the Industrial Designers Society of America (IDSA) in 2003. The team developed Okala Practitioner with support from Autodesk, IBM, Eastman Chemical and the IDSA Ecodesign Section.

Okala Practitioner is available through amazon.com.

More information and the free Okala Ecodesign Strategy App are found at Okala.net.