

**STOANE** LIGHTING

EQUIPMENT DESIGN + MANUFACTURE

Luminaire Design to the Circular Economy

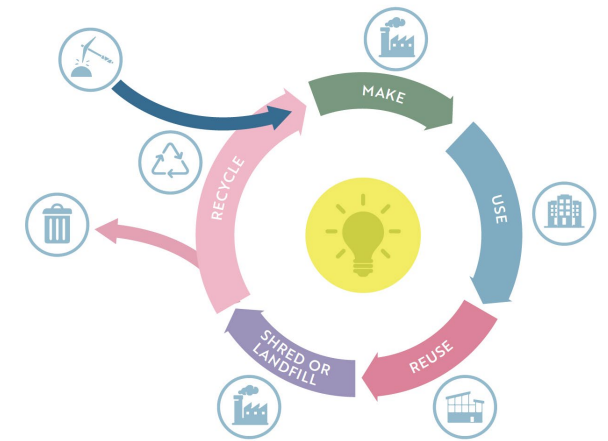
# Topics

- CIBSE TM66 Framework: 'Creating a Circular Economy in the Lighting Industry'
- Product Design
- Manufacturing
- Materials
- Ecosystem

# TM66: ZTA.50.Surface

Circular Economy Assessment Method - Make									
(CIBSE TM66 digital tool)									
Product design									
Circular economy effect	Feature	Select evidence per action towards circular economy					Score	Evidence in support of choice	
		0 No evidence	1 Some positive evidence	2 Positive evidence	3 Excellent positive evidence	4 Outstanding evidence			
		This box weights the results in the optics and accessories sections below, so that fittings not commonly featuring changeable optics are not unfairly penalised	Luminaire or luminaire family with inherently swappable components (such as interior track spot or exterior architectural projector)	All other types of interior or exterior luminaires or luminaire families					
		Choose Luminaire type	<input type="radio"/>	<input type="radio"/>					
circular performance claims	manufacturer should be willing to share certified product testing reports to verify aspects such as photometry, life performance etc.	Lumen maintenance	No lumen maintenance data	Lumen maintenance data (self-declared, non-accredited lab)		Lumen maintenance data (self-declared accredited lab or test house)		3	Lumen maintenance data is made available to us by our light source suppliers. These suppliers will provide maximum tc temperatures which we must stay within to achieve their lumen maintenance figures. Our light fittings always have headroom to ensure we are well under the maximum tc temps in expected ambient conditions (typically up to 35°C). <b>EVIDENCE in document 17 is</b>
Competence and buy in	For circular economy principles to be fully and successfully embodied in a product design, the designer must be trained, competent and increasingly experienced in the topic	Buy in, competence and training of design teams	No buy in, no training	Some circular economy knowledge begging to be applied	Designer moving towards competency, widely applied	Designer experienced in circular economy and acting with full management backing		6	Training/qualifications. Taking a look at those in design/development/project management roles and reviewing their qualifications. They are almost all degree level qualified product designers (predominantly), furniture designers and engineers. Re specialist training in Circular Economy many have taken this course: <a href="https://www.edx.org/course/circular-economy-an-introduction">https://www.edx.org/course/circular-economy-an-introduction</a>

## Creating a circular economy in the lighting industry



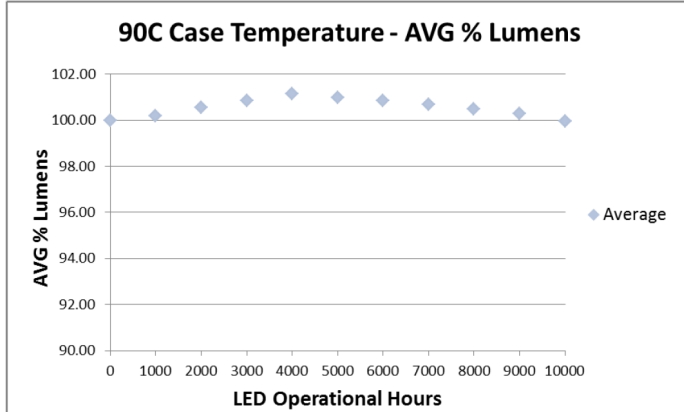
TM66: 2021



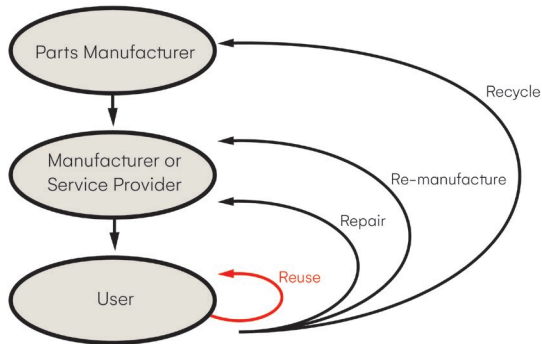
# Product Design

- Keep products in use
  - Durability of housing and design for long-lived components
  - Information retrieval on usage.
  - Making light sources, drivers and optics easily replaceable / upgradeable

# LED Lifetime



Case Temperature 1	
Temperature (°C):	90
Temperature (°K):	363.15
$\alpha$ :	1.96E-06
B:	1.02
Calculated L70 (hrs):	192000
Reported L70 (hrs):	>55000



**Stoane Lighting - Thermal Test Sheet**

Job No. / Product/Component	ZTA.50 Surf XTM at 16.5W	Pass	@16.5W
Date:	25/1/21	Fail	

**Test set up: (see over)** Show test as sketch and/or photograph printed and stapled **overleaf**. Clearly illustrate exactly where the probes are situated and number them 1-9.

**Checklist for Product testing - fill in as appropriate.**

Accessories added? Describe	CEW optic and HC louvre
Worst possible orientation? Describe	horizontal
Worst possible finish? Describe	RAL 9010
Enclosure? Describe.	NA

LED Source (use part number if known)	XTM19803030CCA	<b>Discreet LED type:</b> Note, temps often limited by PCB material. Xicato XOB max Ts: 85°C at ambient 25°C Cree XM-L colour max Ts: 75°C at 25°C Luminus CHM-6 max Ts: 95°C at 25°C Luminus MP2016 max Ts: 75°C at 25°C Osram Oslon Square max Ts: 75°C at 25°C Xicato XIM/XTM module Max Tc = 80°C at 25°C
CCT	3000K	
Drive Current or DC Voltage	700mA	<b>Fitting Case Temperature:</b> For metal fittings it must be noted if the (touchable) case temperature, particularly around the adjustment areas (locks etc.) exceeds 60 degrees. For non-metal fittings it must be noted if the surface temperature exceeds 75°C. Measured at 25°C ambient.
Wattage	16.5W	
Max Ts/Tc of the LED @ 25°C	80°C	Metal fitting max surface temp at 25°C ambient: 60°C
Max Temperature measured @ 25°C	76.2°C	
Max Safe Ambient of LED (°C)	35°C	Non-metal fitting max surface temp at 25°C ambient:
Max Tc of Driver (if required)		
Max Driver temp measured @ 25°C		
Max Safe Ambient of driver (°C)		
Optic		
Max temp of optic @ 25°C		

**Other Considerations – Please specify mount surface or any other critical thermal considerations below.**

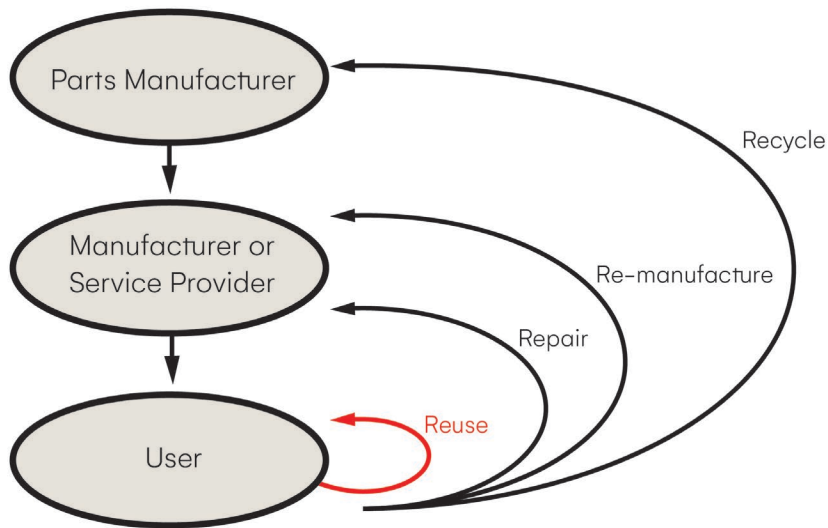
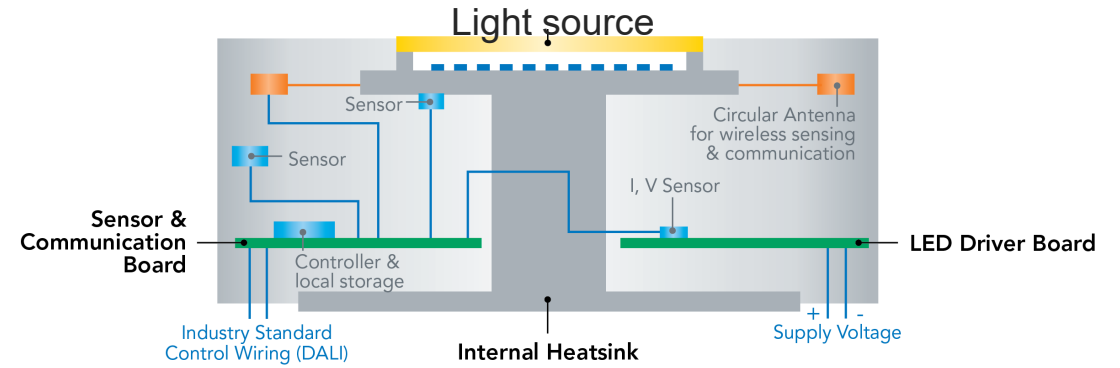
MAINSERVER\MSL Data\thermal tests, lamp, weights and other data\thermal testing data sheet.doc

⚙	Ambient (°C)	XTM Tc POINT (°C)	Case Temp (°C)
	Max.	Max.	Max.
00:00:00	16.4	67.6	53.9
00:20:00	16.9	68.2	54.3
00:40:00	17.5	68.7	54.7
01:00:00	18.0	69.0	54.8
01:20:00	18.5	69.6	55.2
01:40:00	19.0	69.9	55.4
02:00:00	19.3	70.3	55.7
02:20:00	19.5	70.4	55.6
02:40:00	19.9	70.7	55.8
03:00:00	20.0	71.1	56.2
03:20:00	19.9	71.2	56.2
03:40:00	20.1	71.4	56.1
04:00:00	20.6	71.8	56.1
04:20:00	20.8	72.1	56.1
04:40:00	21.0	72.2	56.0

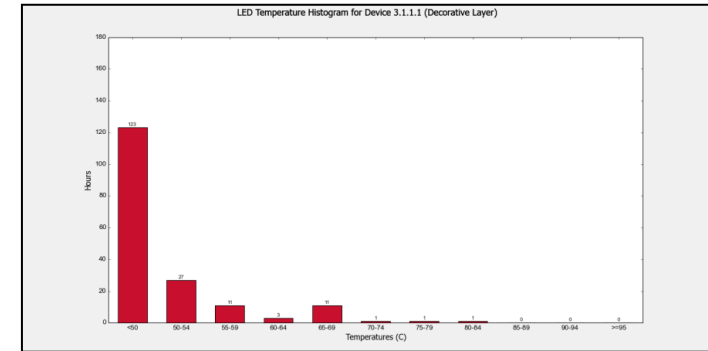
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# Information Retrieval



board		Bluetooth	Log	Light Setup	Sensor Setup	Light Control	Settings
<b>Real Time Data</b>							
Intensity	54.8	%					
Power	14.7	W					
Tc Temperature	67	C					
PCB Temperature	65	C					
Supply Voltage	48.08	V					
Supply Ripple	1420	mV					
Module Status	OK						
<b>Additional Data</b>							
Power Cycles	11						
LED Cycles	26						
Operation Hours	12						
<b>Individual Device</b>							
Save Log Data							
Clear Log Data							
Real Time Graph							
Device Information							
Intensity Histogram							
Temperature Histogram							



Images courtesy Xicato

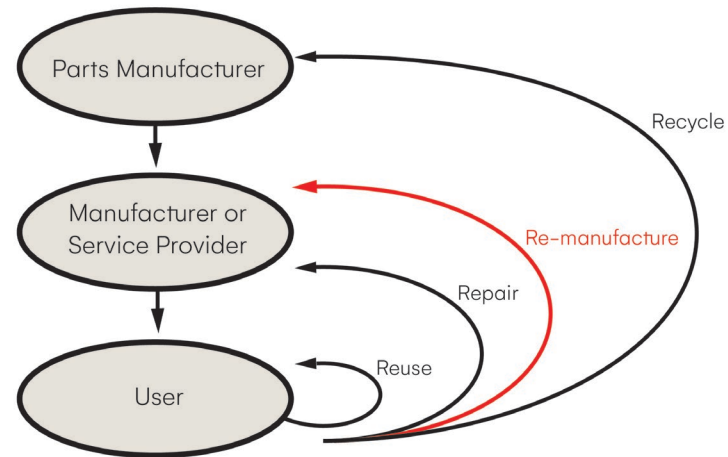
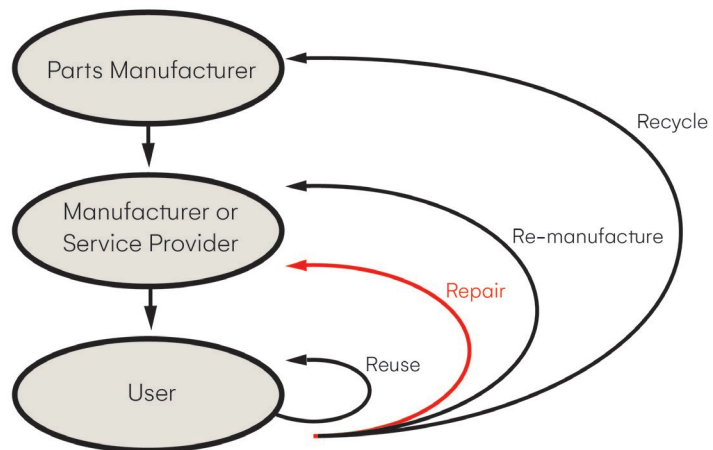
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# Replaceable / Upgradeable Optics, Light Sources and Drivers

Design of repairable and re-manufacturable luminaires.

- Easy access to and replacement of components that are predicted to fail during the life of the luminaire
- Product designs ease the use of alternate or upgraded parts.
  - Extra fixing holes to facilitate subsequent use of different component types
  - Leeway mechanically
  - Leeway thermally



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# Materials

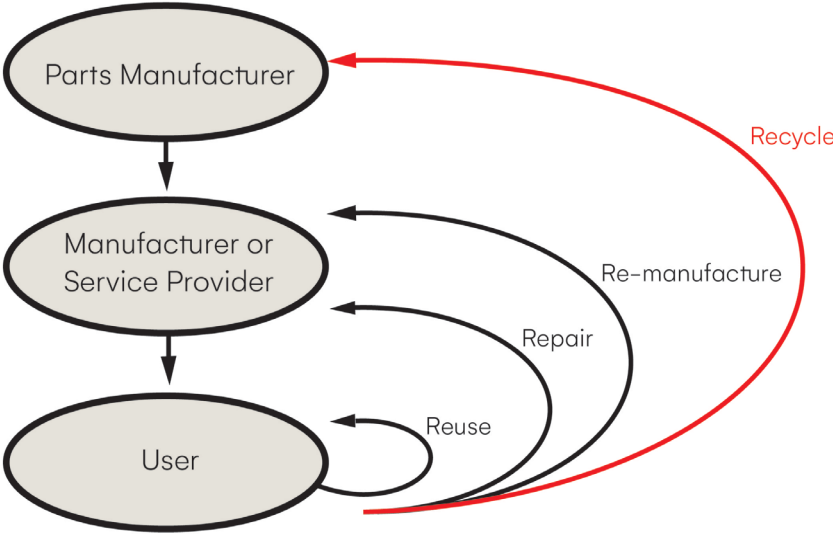
- Recycled materials
- EOL recycling



# Aluminium Recyclability

Recycled aluminium is indistinguishable from Primary Alloys.

- Recycling aluminium requires only 5% of the energy used to create primary aluminium
- Recycling aluminium produces only 5% of the GHG gas emissions generated in primary production
- 75% of all material produced, about 1 billion tonnes, is still in use today

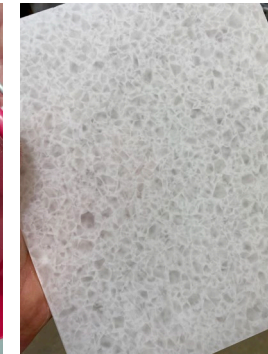
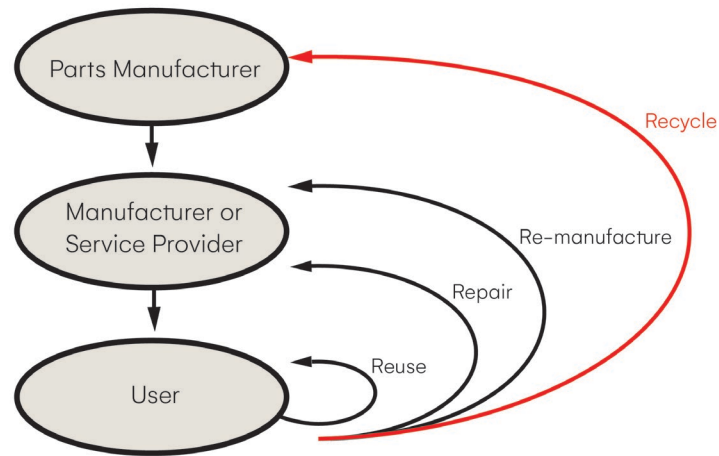


With permission from The Aluminium Federation

# PMMA Recyclability

## Acrylic and the environment

- PMMA is not biodegradable but infinitely recyclable
- Lower energy and emissions with recycling c/w new production



PMMA for recycling is shredded and then granulated. The PMMA granules can be recast.



Stoane Lighting fixtures with virgin and recycled PMMA.

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# EOL recycling

Sticker\* directs operator to website



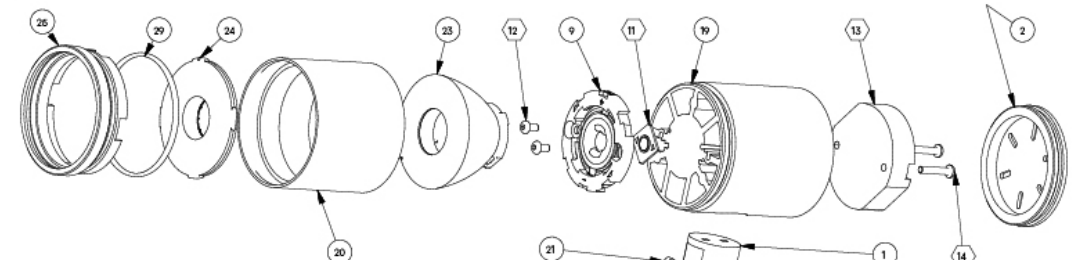
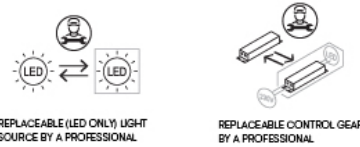
Enter Unique Serial Number into maintain and recycle part of web site

disassembly information

## ZTA.50.SURFACE.ZOOM DISASSEMBLY AND MAINTENANCE NOTES

Fitting must be turned off and isolated from the supply before performing maintenance.

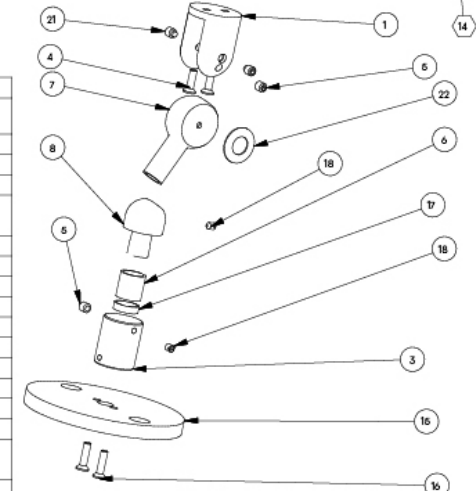
CATEGORY:  
 LIGHT SOURCE   
 CONTAINING PRODUCT   
 CONTROL GEAR



PARTS LIST								
ITEM	DESCRIPTION	STOCK NUMBER	CONTACT 3RD PARTY	TOOL REQUIRED	MATERIAL	MASS	REPLACEABLE BY	JUSTIFICATION IF NOT REPLACEABLE
1	SL COMPONENT	ITY-002662			ALUMINIUM	0.011 kg		
2	SL COMPONENT				ALUMINIUM	0.077 kg		
3	SL COMPONENT				ALUMINIUM	0.008 kg		
4	CONSUMABLE: Socket Head Countersunk Screw			2mm ALLEN KEY	STAINLESS STEEL	0.001 kg		
6	CONSUMABLE: GRUB SCREW			2mm ALLEN KEY	STAINLESS STEEL	0.001 kg		
6	SL COMPONENT				BRASS	0.003 kg		
7	SL COMPONENT				ALUMINIUM	0.012 kg		
8	SL COMPONENT				ALUMINIUM	0.006 kg		
9	LED HOLDER				PC	0.004 kg		
(11)	XICATO 6mm XCB		XICATO	SOLDERING IRON	CONTACT 3RD PARTY	0.006 kg		
12	CONSUMABLE:Socket Button Head Screw			2mm ALLEN KEY	STAINLESS STEEL	0.001 kg		
(13)	DRIVER		XICATO		CONTACT 3RD PARTY	0.026 kg		
14	CONSUMABLE:Socket Button Head Screw			2mm ALLEN KEY	STAINLESS STEEL	0.001 kg		
16	SL COMPONENT	ITY-001026			ALUMINIUM	0.061 kg		
16	CONSUMABLE:Socket Head Countersunk Screw			2mm ALLEN KEY	STAINLESS STEEL	0.001 kg		
17	SL COMPONENT	ITY-003676			Brass	0.001 kg		
18	CONSUMABLE: SET SCREWS			SMALL FLAT HEAD SCREWDRIVER	Steel Mild	0.000 kg		
19	SL COMPONENT	ITY-003689			ALUMINIUM	0.165 kg		
20	SL COMPONENT	ITY-004301			ALUMINIUM	0.043 kg	<input checked="" type="checkbox"/>	
21	CONSUMABLE: Socket Set Screw			2mm ALLEN KEY	Steel Mild	0.000 kg		
22	CONSUMABLE: SPRING WASHER	ITY-004670			STAINLESS STEEL	0.001 kg		
23	OPTIC				PMMA	0.033 kg	<input checked="" type="checkbox"/>	
24	OPTIC				PMMA	0.006 kg	<input checked="" type="checkbox"/>	
26	SL COMPONENT				ALUMINIUM	0.013 kg	<input checked="" type="checkbox"/>	
29	CONSUMABLE: O-RING				SILICONE	0.001 kg	<input checked="" type="checkbox"/>	
30	WIRE LOOM (NOT SHOWN)		XICATO		CONTACT 3RD PARTY			
32	WIRES (NOT SHOWN)		XICATO		CONTACT 3RD PARTY			

LIGHT SOURCE/CONTROL GEAR

PROFESSIONAL  
 USER  
 NOT REPLACEABLE



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\*could be QR, NFC etc if we trust for longevity.

# Manufacturing

- Subtractive and additive manufacturing
- Modular design
- Repurposing waste

# Subtractive and additive manufacturing



# Modular Design and Reusing Components



STX2.50



ZTA.50.Surface



Frog Type X



Frog Type X Zoom



STX2.70



ZTA.70.Surface



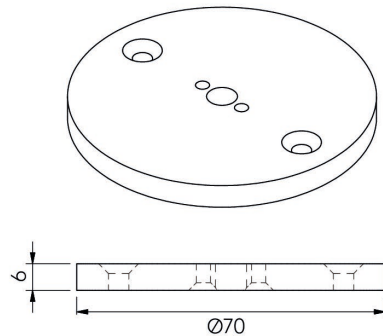
Croc Type X



STX2.111



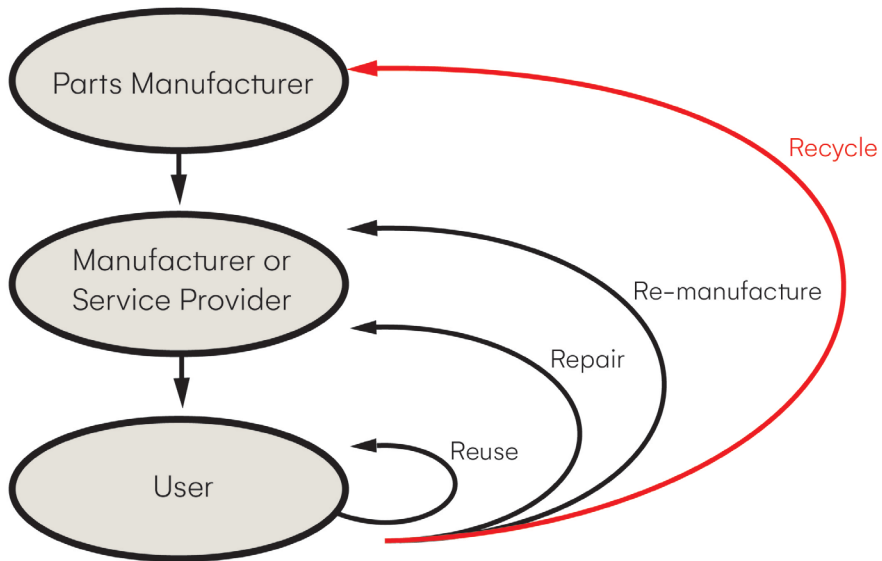
Toad Type X



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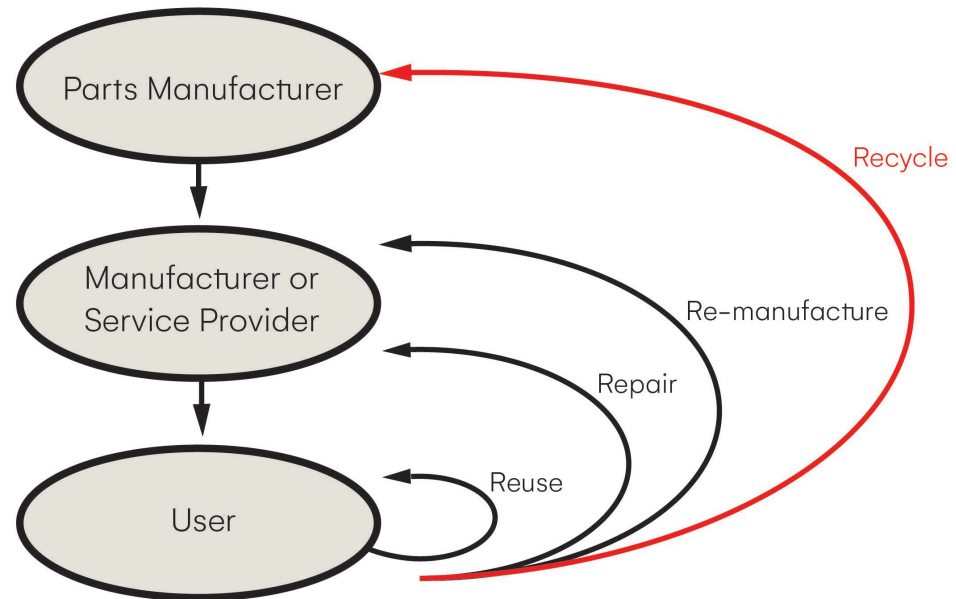
# Repurposing Waste: Aluminium



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# Repurposing Waste: Plastic



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# Ecosystem

- Systems to repurpose or repair packaging and products
  - Repurposing packaging
  - Repairing or remanufacturing luminaires

# Packaging

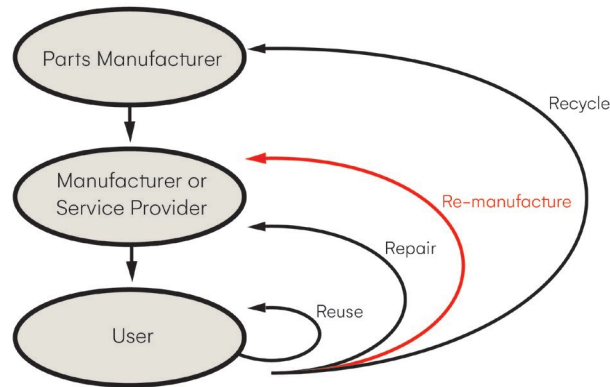
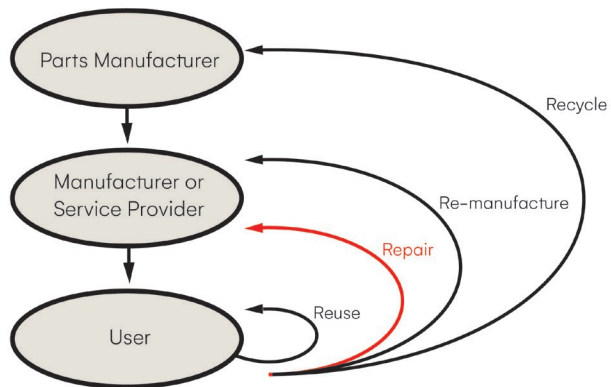
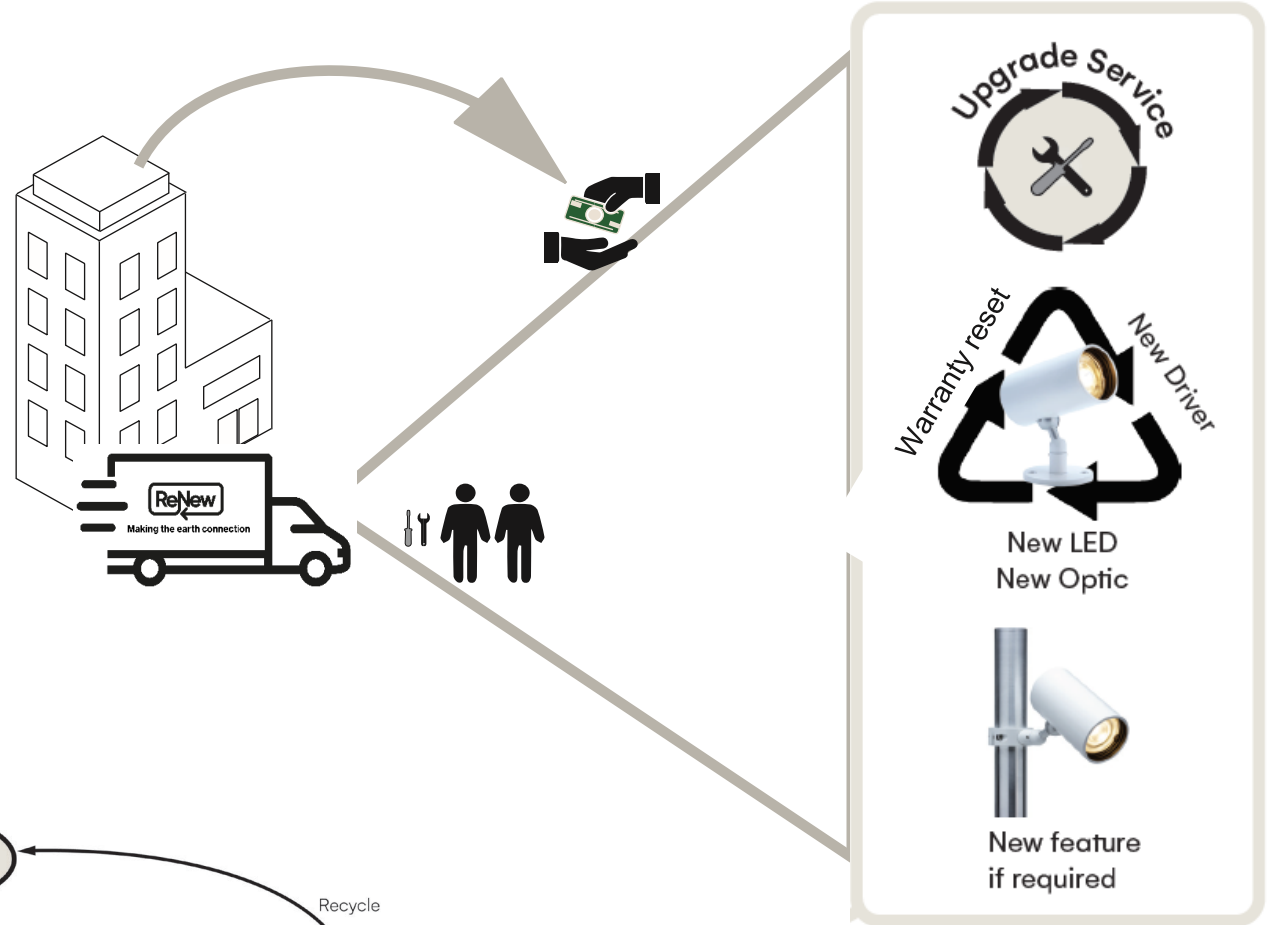
- Reuse packaging
- Recycle packaging
- Eliminate plastic
- Replacement of traditional inks with VOC-free vegetable carrier for the packaging branding.



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# Making Repairs and Remanufactures Happen: On-site Upgrades



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# Circular Economy in Action



SL distributor: The Lux Company, The Netherlands  
Lighting Design: Henk van der Geest  
Photography: Jan Kees Steenman



Van Gogh Museum  
Remanufacturing: standard track spots to Bluetooth controlled versions

[Video link.](#)

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