Ecoinvent 3.3 dataset documentation

reefer production, intermodal shipping container, 40-foot, high-cube, R134a as refrigerant - GLO

Dataset identification

Activity name	reefer production, intermodal shipping container, 40-foot, high-cube, R134a as refrigerant
Geography	GLO (Global)
Time period	2010-01-01 to 2014-12-31 Valid for the entire period
Synonyms	ISO container sea can reefer
ISIC 4 classification	2920: Manufacture of bodies (coachwork) for motor vehicles; manufacture of traile
Reference product	reefer, intermodal shipping container, 40-foot, high-cube, R134a as refrigerant
CPC classification	49221: Containers specially designed and equipped for carriage by one or more modes of transport
Dataset type	Ordinary transforming activity
Technology level	Current
Version - system model	3.3 - undefined

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Notes: This document contains only an extract of the information in the dataset. Additional data about properties of exchanges, mathematical relations, parameters, and contact information for authors and reviewers are available in the full dataset, e.g. through the ecoinvent website. Amount and identity of the exchanges in an undefined dataset are independant of modeling choices in by the different system models. Linked dataset are available in separate documents.

Link to the dataset on the ecoinvent website

Dataset authorship

Role	Date	Name, organisation
Data generator	2014-10-15	Tereza Levova, ecoinvent Centre active author
Review	2014-12-19	Emilia Moreno Ruiz, ecoinvent Centre
Review	2014-12-19	Christian Bauer, Paul Scherrer Institute

Exchange summary

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Reference products	Material for treatment	Byproduct classif.	Amount
reefer, intermodal shipping container, 40-foot, high-cube, R134a as refrigerant	no	allocatable product	1.0 unit
By-products	Material for treatment	Byproduct classif.	Amount
used reefer, intermodal shipping container, 40-foot, high-cube	yes	Waste	1.0 unit
waste polyurethane foam	yes	Waste	49.8 kg
Inputs from technosphere			Amount
aluminium, wrought alloy			3.63e+2 kg
building, hall			0.0244 m2
chromium steel pipe			11.2 kg
metal working, average for aluminium product manufacturing			3.63e+2 kg
metal working, average for chromium steel product manufacturing			11.2 kg
metal working, average for steel product manufacturing			3.02e+3 kg
polypropylene, granulate			2.59e+2 kg
polyurethane, rigid foam			4.98e+2 kg
refrigeration machine, R134a as refrigerant			1.0 unit

Inputs from technosphere	Amount
steel, low-alloyed, hot rolled	3.02e+3 kg
synthetic rubber	5.89 kg
welding, arc, steel	70.1 m
zinc coat, pieces	4.33e+2 m2

Dataset description

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General comments

This dataset represents production of reefer (refrigerated container), 40-foot, high-cube ISO standard container.

The intermodal shipping containers are basically metal boxes which are used for storage and transport of goods. The advantage of using these containers is, that they can be easily transferred from one type of transport to another without the necessity of unloading the goods.

There are several types and sizes of the containers mainly related to the historical development of intermodal container transport in the given region. There is a continuous effort in the standardization of the container sizes. Below see the table of the different sizes of the intermodal shipping containers as defined by the ISO standard (ISO 6346:1995, ISO 1161:1984, ISO 1496-1:2013).

		20′ container		40′ container		40′ high-cube container		45′ high-cube container	
		imperial	metric	imperial	metric	imperial	metric	imperial	metric
external dimensions	length	19′ 10 1/2″	6.058 m	40′ 0″	12.192 m	40′ 0″	12.192 m	45′ 0″	13.716 m
	width	8′ 0″	2.438 m	8′ 0″	2.438 m	8′ 0″	2.438 m	8′ 0″	2.438 m
	height	8′ 6″	2.591 m	8′ 6″	2.591 m	9′ 6″	2.896 m	9′ 6″	2.896 m
interior dimensions	length	18′ 8 13/16″	5.710 m	39′ 5 45/64″	12.032 m	39′ 4″	12.000 m	44′ 4″	13.556 m
	width	7′ 8 19/32″	2.352 m	7′ 8 19/32″	2.352 m	7′ 7″	2.311 m	7′ 8 19/32″	2.352 m
	height	7′ 9 57/64″	2.385 m	7′ 9 57/64″	2.385 m	8′ 9″	2.650 m	8′ 9 15/16″	2.698 m
door aperture	width	7′ 8 1/8″	2.343 m	7′ 8 1/8″	2.343 m	7′ 6″	2.280 m	7′ 8 1/8″	2.343 m
	height	7′ 5 3/4″	2.280 m	7′ 5 3/4″	2.280 m	8′ 5″	2.560 m	8′ 5 49/64″	2.585 m
internal volume		1,169 ft³	33.1 m³	2,385 ft³	67.5 m³	2,660 ft³	75.3 m³	3,040 ft³	86.1 m³
maximum gross weight		66,139 lb	30,400 kg	66,139 lb	30,400 kg	68,008 lb	30,848 kg	66,139 lb	30,400 kg
empty weight		4,850 lb	2,200 kg	8,380 lb	3,800 kg	8,598 lb	3,900 kg	10,580 lb	4,800 kg
net load		61,289 lb	28,200 kg	57,759 lb	26,600 kg	58,598 lb	26,580 kg	55,559 lb	25,600 kg

Reefer is used for transport of goods which need atmosphere (mainly temperature) control during the transport. The difference between the dry cargo containers is, that reefers have foam insulation and attached refrigeration unit. The external size is the same as in case of dry cargo containers, but the internal volume is smaller due to the fact, that the space is partially taken by the refrigeration unit and the insulation.

Data for the life cycle inventory of this container were taken from different sources, primarily from the documentation of different container producers. The main sources of information is the technical documentation from Mearsk container industry (Marq Q container technical description) and Steinecker Containerhandel (Technical Specification for typical 40"x8"x9"6" ISO Type Steel Dry Cargo Container, "High Cube", 2012).

Reefer (refrigerated container). Source (http://www.friconreefer.nl/index.php?categoryID=20&menu;=1, accessed 20141015).

While reefers have their own integral refrigeration unit, they rely on external power. Most reefers are fitted with a standard plugs which means, they can be connected to different power points. On the ships they can be directly connected to the vessel"s internal electricity system or the power can be supplied by auxiliary diesel generators. While being transported by train or truck the power is usually supplied by so called "gensets" which are basically auxiliary diesel generators.

Auxiliary diesel generator unit (genset) providing power to the reefer during transport on a truck, ship or train (http://www.gopixpic.com/600/reefer-container-gensets-40kva-keyword-/, accessed 20141031).

Included activities start

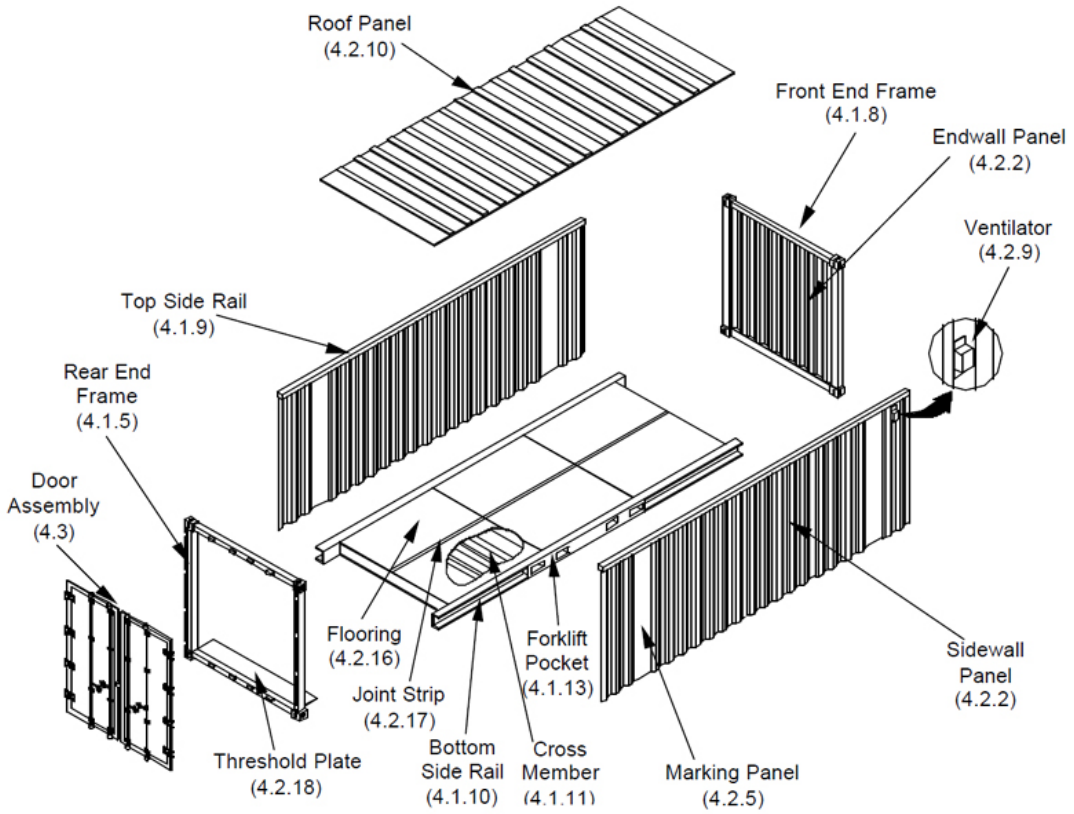
The activity starts when all the individual parts needed for the production of a container enter the assembly site.

Included activities ends

The activity ends when the container is ready to be used.

Technology comments

The container side rails are welded to create a frame. The walls of the container are made from corrugated steel. In order to protect the container againt different weather conditions zinc coating is needed.



Technical sketch of the differnt parts of the shipping container. Source: (http://shippingandfreightresource.com/how-strong-is-your-container-floorboard/, accessed 20141015).

The container has door on one side which can be locked using four locking bars. The doors have rubber seal gasket to ensure the water resistence of the container.

Detailed information for exchanges

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Reference product	Annual prod.vol.	Amount
reefer, intermodal shipping container, 40-foot, high-cube, R134a as refrigerant	4.05e+4 unit	1.0 unit

The comment entered by the data provider is too long to be displayed. Please refer to ecoQuery or ecoEditor for more details.

By-products	Annual prod.vol.	Amount
used reefer, intermodal shipping container, 40-foot, high-cube	4.05e+4 unit	1.0 unit

Comment: Calculated value.
Production volume comment: Calculated from production volume of reference product using the relative outputs.
Uncertainty distribution: lognormal; **GSD2:** 1.02; **Pedigree matrix:** [1, 1, 1, 1, 1]

waste polyurethane foam	2.02e+6 kg	49.8 kg

Comment: Estimated value. It is estimated, that app. 10% of the insulation is cut-off as a waste during the assembly of the container.
Production volume comment: Calculated from production volume of reference product using the relative outputs.
Uncertainty distribution: lognormal; **GSD2:** 1.14; **Pedigree matrix:** [4, 5, 1, 1, 1]
Source: Maersk Container Industry 2013

Inputs from technosphere	Amount
aluminium, wrought alloy	3.63e+2 kg

Comment: Calculated value based on the knowledge of the cross section of the T-bone floor.
Uncertainty distribution: lognormal; **GSD2:** 1.11; **Pedigree matrix:** [4, 4, 1, 1, 1]
Source: Maersk Container Industry 2013

Inputs from technosphere	Amount
building, hall	0.0244 m2
Comment: Calculated value based on estimates. 1m2 of hall is available every day for 50 years. 1 container occupies the area of its base for the period of 15 days. Resulting lifetime capacity of m2 of hall is 41 containers. Thus one container is responsible of construction of 0.024m2 of a hall. **Uncertainty distribution:** lognormal; **GSD2:** 1.75; **Pedigree matrix:** [4, 5, 1, 1, 1] **Source:** Maersk Container Industry 2013	
chromium steel pipe	11.2 kg
Comment: Industrial value (Jost, Products for Container Equipment and Intermodal transports, http://www.jost-world.com/workflow/pdfanleitungen/kataloge/JOST_CT_ZDE180000039E_0910.pdf, accessed 20141014). There are 4 locking bars on the container. **Uncertainty distribution:** lognormal; **GSD2:** 1.04; **Pedigree matrix:** [2, 3, 1, 1, 1] **Source:** Maersk Container Industry 2013	
metal working, average for aluminium product manufacturing	3.63e+2 kg
Comment: Calculated value. **Uncertainty distribution:** lognormal; **GSD2:** 1.04; **Pedigree matrix:** [2, 3, 1, 1, 1] **Source:** Maersk Container Industry 2013	
metal working, average for chromium steel product manufacturing	11.2 kg
Comment: Calculated value. **Uncertainty distribution:** lognormal; **GSD2:** 1.04; **Pedigree matrix:** [2, 3, 1, 1, 1] **Source:** Maersk Container Industry 2013	
metal working, average for steel product manufacturing	3.02e+3 kg
Comment: Calculated value. This exchange represent general metal working of the steel to form it into all the individual components needed for the assemby of the container. **Uncertainty distribution:** lognormal; **GSD2:** 1.04; **Pedigree matrix:** [2, 3, 1, 1, 1] **Source:** Maersk Container Industry 2013	
polypropylene, granulate	2.59e+2 kg
Comment: Calculated value. The walls are covered on the inside of the container by polypropylene fibre reinforced thermoplastic. Since this product is not available in the database ordinary polypropylene is used instead. **Uncertainty distribution:** lognormal; **GSD2:** 1.14; **Pedigree matrix:** [4, 5, 1, 1, 1] **Source:** Maersk Container Industry 2013	
polyurethane, rigid foam	4.98e+2 kg
Comment: Calculated value. **Uncertainty distribution:** lognormal; **GSD2:** 1.06; **Pedigree matrix:** [3, 3, 1, 1, 1] **Source:** Maersk Container Industry 2013	
refrigeration machine, R134a as refrigerant	1.0 unit
Comment: Literature value. **Uncertainty distribution:** lognormal; **GSD2:** 1.02; **Pedigree matrix:** [1, 1, 1, 1, 1] **Source:** Maersk Container Industry 2013	
steel, low-alloyed, hot rolled	3.02e+3 kg
Comment: Calculated value based on dimentions, thickness and density of the material. This exchange represent the amount of steel needed both for the frame and the sides of the container. **Uncertainty distribution:** lognormal; **GSD2:** 1.04; **Pedigree matrix:** [2, 3, 1, 1, 1] **Source:** Maersk Container Industry 2013	
synthetic rubber	5.89 kg
Comment: Calculated value. The seal gasket is made of EPDM synthetic rubber. It cover all the edges of the container door. **Uncertainty distribution:** lognormal; **GSD2:** 1.04; **Pedigree matrix:** [2, 3, 1, 1, 1] **Source:** Maersk Container Industry 2013	
welding, arc, steel	70.1 m
Comment: Calculated value based on estimates. **Uncertainty distribution:** lognormal; **GSD2:** 1.04; **Pedigree matrix:** [2, 3, 1, 1, 1] **Source:** Maersk Container Industry 2013	

Inputs from technosphere	Amount
zinc coat, pieces	4.33e+2 m2

Comment: Calculated value. The "zinc coating, pieces" dataset is created for the thickess of the coat of 65µm. While the interior coating of the container should be approximatelly 65µm the exterior should be at least double (Steinecker, 2012). So the additional amount of coating is added to assure the correct thickness of the exterior coat.
Uncertainty distribution: lognormal; **GSD2:** 1.04; **Pedigree matrix:** [2, 3, 1, 1, 1]
Source: Maersk Container Industry 2013

Source
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Source information

First author: Maersk Container Industry
Title: Maersk Mark Q container technical description
Year: 2013

Restriction of use