Product Life Cycle Assessment - LCA

XBO 4000 W/DHP OFR

This life-cycle assessment of the XBO 4000 W/DHP OFR comprises the entire life of a product, from raw material extraction and acquisition, through material production and manufacturing, to use and end of life treatment including recycling and final disposal.

The method for these analyses was an assessment following in principle the international standards ISO 14040 and 14044. Apart from the primary energy consumption, the impact on the environment was evaluated in specific categories. The LCA was calculated with the life cycle modelling program GaBi.

Short description of product

For the past 60, years, the ams OSRAM XBO lamp has delighted audiences worldwide and transformed a visit in the cinema into an experience to remember. Also new digital cinema projectors and large screens require a high light output. ams OSRAM´s XBO cinema lamps rise to the challenge with a level of luminance that guarantees brilliant, high-resolution images.

The here considered ams OSRAM XBO DHP Xenon short-arc lamp is made for digital cinema projection. It is a xenon short-arc lamp with very high luminance and a constant color temperature of 6,000 K throughout the entire lamp lifetime.

Electrical and optical data

	Unit	Value
Nominal wattage	W	4,200
Lamp voltage	V	34
Nominal current	A	123
Color temperature	K	6,000
Liftetime (L80/B50)	h	1,100
Weight	kg	0.638
Dimensions	mm	Diameter 60, length 345

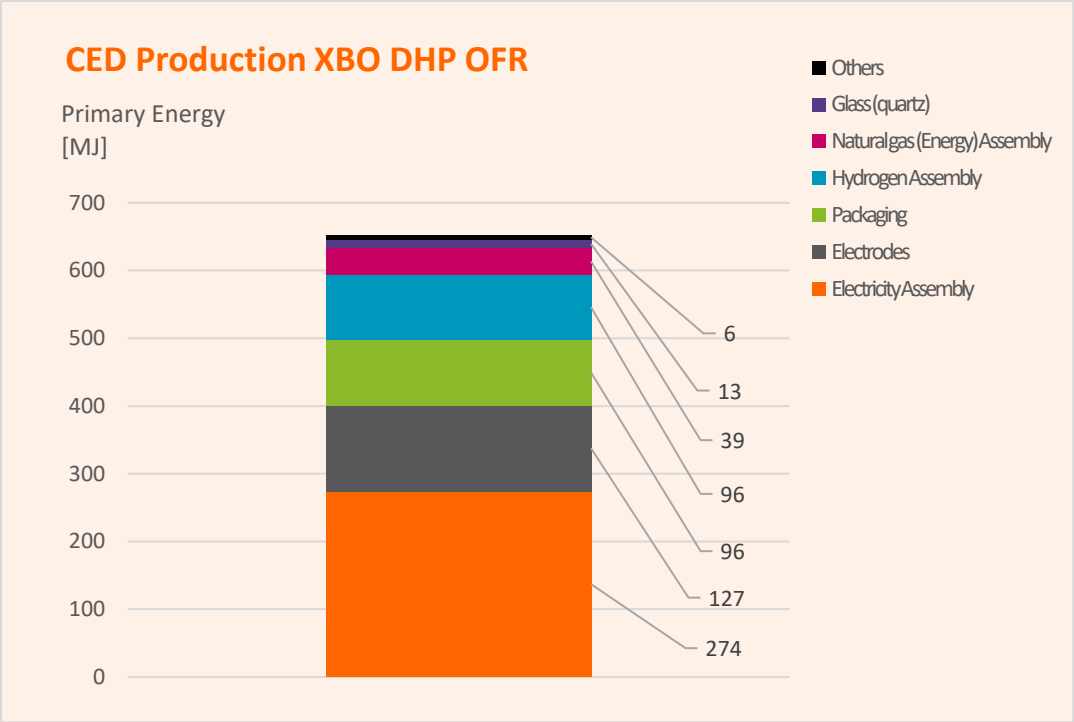
Material composition

In order to consider the weight of the different materials especially in small components and components in compounds, the following values are calculated (rounded values). The XBO lamp does not contain mercury.

MATERIAL	WEIGHT	PERCENTAGE
NON-FERROUS METALS	371 g	17.0 %
GLASS (QUARTZ)	161 g	7.4 %
FERROUS METALS	108 g	4.9 %
OTHER	15 g	0.7 %
PACKAGING	1,534 g	70.1 %
TOTAL	**2,189 g**	**100.0 %**

Determining CED during the production phase

To determine the amount of energy needed in the manufacturing phase, all the materials used, their masses and production steps are considered. During this phase, transportation of the major components is also taken into account. The cumulative energy demand during the production phase is shown in the diagram below. The electricity consumption for the assembly of the XBO and the production of the electrodes account for the majority of energy required in the production phase.



Calculating CED during the usage phase

For the usage phase a lifespan of 1,100 hours has been assumed, resulting in a CED of 51,351 MJ_{Prim} by calculating with the German energy mix.

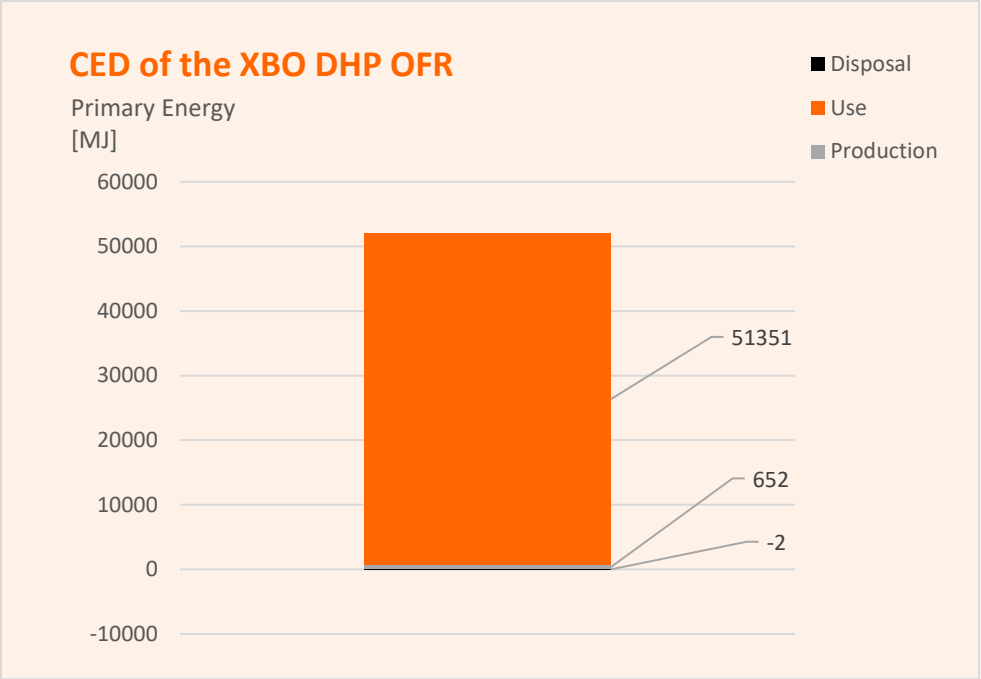
1.)	Electrical power consumption during life (1,100 hours)	4,200 W_{El} * 1,100 h = 4,620 kWh_{El}
2.)	Energy mix (includes average power plant efficiency)	1 kWh_{El} requires 3.0875 kWh_{Prim}
3.)	Cumulative energy demand	4,620 kWh_{El} * 3.0875 kWh_{Prim}/kWh_{El} = 14,264 kWh_{Prim} 14,264 kWh_{Prim} * 3.6 MJ_{Prim}/kWh_{Prim} = 51,351 MJ_{Prim}

Disposal phase

In this assessment, incineration of the plastic components and the packaging of the XBO in a municipal waste-to-energy plant is assumed. This represents the worst-case scenario. Nevertheless, during this process, a small amount of energy can be recovered. A much higher amount of energy recovery and further environmental benefits are obtained by recycling the non-ferrous and ferrous parts of the product.

CED (Cumulative Energy Demand) of the XBO

The following diagram shows the results of the lifecycle assessment of the XBO 4000 W/DHP OFR. Analysis shows that over 98% of the energy is consumed during the usage phase. In the end-of-life phase, there is in relation to the overall CED a negligible benefit (-0.004%) from energy recovery through the re-use of metal components and waste incineration.



Considering that most of the energy demand of lighting products is during the usage phase, improvements can mainly be achieved by increasing efficacy of the lamp (lm/W) in the projector.

Environmental impacts of all lifecycle phases

Impact Category	Unit	Production	Usage	Disposal
Cumulative Energy Demand (CED)	MJ	652	51,351	-2
Global Warming Potential (GWP)	kg CO_2 eq.	34	2,700	3
Acidification Potential (AP)	kg SO_2 eq.	0.05	4.01	0.00
Eutrophication Potential (EP)	Kg PO_4 eq.	0.01	0.64	0.00
Photochemical Ozone Creation Potential (POCP)	Kg Ethane eq.	0.01	0.28	0.00
Human Toxicity Potential (HTP)	Kg DCB eq.	2.28	90.90	-0.16
Abiotic Depletion Potential (ADP) (fossil)	MJ	499	26,300	-1