Environmental Product Declaration

UniSwitch
Medium Voltage Equipment

ABB Power Distribution

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1. Environmental Product Declaration

Either we talk about a product or a process, its effects reach far away to the future. For example copper bar has gone through many different processes and it has been transferred many times from place to place before it ends up to the final product. Each process affects more or less the nature around us with its possible emissions. If we won't develop our processes and our way of working, sooner or later we will be running out of new raw materials and additionally the earth will be full of useless components, products and dangerous wastes. We must be capable of learning to use more recyclable raw materials and we must develop components, processes and products, which consume less power.

Picture 1.

Environmental Product Declaration is used to help us to find out environmental aspects and critical points in our production chain. Also we can more easily discover possible affects that may occur during products life cycle.

As a tool to manage to do that there are several tools and databases including information about each raw materials effect to the environment.

In this study we used ABB's LCA (Life Cycle Analysis) Version 5.1.0d program with its databases. Every raw material needed were put into program in kilograms with its possible transport type (Lorry <18 tonnes 96-, 500 km) and distance from where the components and raw-materials are delivered. Also electrical consumption is noticed, but in this first study of ours electric boundaries were set to include our own assembly only.

In the future the requirements of the products pro-environmental aspects will considerably enlarge.

2. ABB

ABB is a global technology and engineering group, which is based on high standards of knowledge and services. We serve our customers in 140 countries world-wide. In Finland the ABB companies are the most important technology partners in its field of activity and one of the major export companies.

2.1 ABB Transmit Oy

ABB Transmit Oy is a company specialising in power transmission and distribution systems. Our products and services include the following

* Transmission and distribution projects, diesel electrifications
* MV Systems
* Step up and system transformers
* Power Transformers

In product development we work in close co-operation with the customers. We are able to provide the best technical solutions where also the personnel safety, operation security and environmental aspects are considered. But we provide more than technical expertise. Financing, consultation and relationship management are integral parts of our operation.

2.2 ABB Transmit Oy, MV Systems Division

Main product groups of MV Systems Division are metal-enclosed switchgear for primary and secondary substations, instrument transformers, current and voltage transformers, sensors, motor operating devices, indoor and pole-mounted disconnectors as well as SF_6 switch-disconnectors.

Picture 2.

Picture 3.

2.3 Environment

ABB is a signatory to the ICC[1] Business Charter for Sustainable Development and is working toward fulfilling its requirements. Our environmental policy is based directly on the 16 principles of the ICC Charter.

[2]ABB is currently working to fulfil two corporate environmental objectives - firstly, to implement ISO 14001 in all its manufacturing and service sites by the end of 1999, and secondly, to have quantified, visible and communicated environmental goals and improvement programs implemented for ABB's core product lines, and integrated into the strategies of all business areas, by the year 2000.

2.4 From ABB's policy for environmental protection

1. ABB's present and future operations and processes will comply with environmental standards and legislation.

2. ABB will strive to develop and provide products and services with reduced harmful environmental impacts that are safe in use and can be recycled, reused or disposed of safely. This includes the products and services bought from ABB's suppliers and subcontractors. In our research and development we aim for innovative and environmentally sound technologies, systems and products. To support his customers and protect the environment during maintenance and at the end of service life of their switchgear, ABB is offering a complete service program aimed at eliminating any release into the atmosphere.

2.5 General description of the market

Market segments are defined as follows: utilities 25 %, building and public service 60 % and light industry 15 % of total volume.

[1] International Chamber of Commerce
[2] ABB Transmit Oy has fulfilled ISO 14001

3. UniSwitch

3.1 Business area

Business area in ABB's Global organisation is DMS/Medium voltage equipment and UniSwitch belongs to business unit 3410/Air insulated panels/switchboards (AIS).

3.2 Product lines

There are wide range of cybicle types from BMC to SMC to satisfy the customer needs. Every

In this environmental product declaration we have chosen SDC to be under study because of its great wideness through the markets. It is to be sold from 50 to 70 per cents from all of our switchgear cubicals.

BMC	Busbar Measuring Cubicle
BRC	Bus Riser Cubicle
CBC	Circuit Breaker Cubicle
DBC	Direct Busbar connection Cubicle
SBC	Sectionalizing Breaker Cubicle
SDC	**Switch-Disconnector Cubicle**
SDF	Switch-Disconnector with fuse Cubicle
SEC	Sectionalizing Cubicle
SMC	Sectionalizing Metering Cubicle

3.3 SDC's Technical data

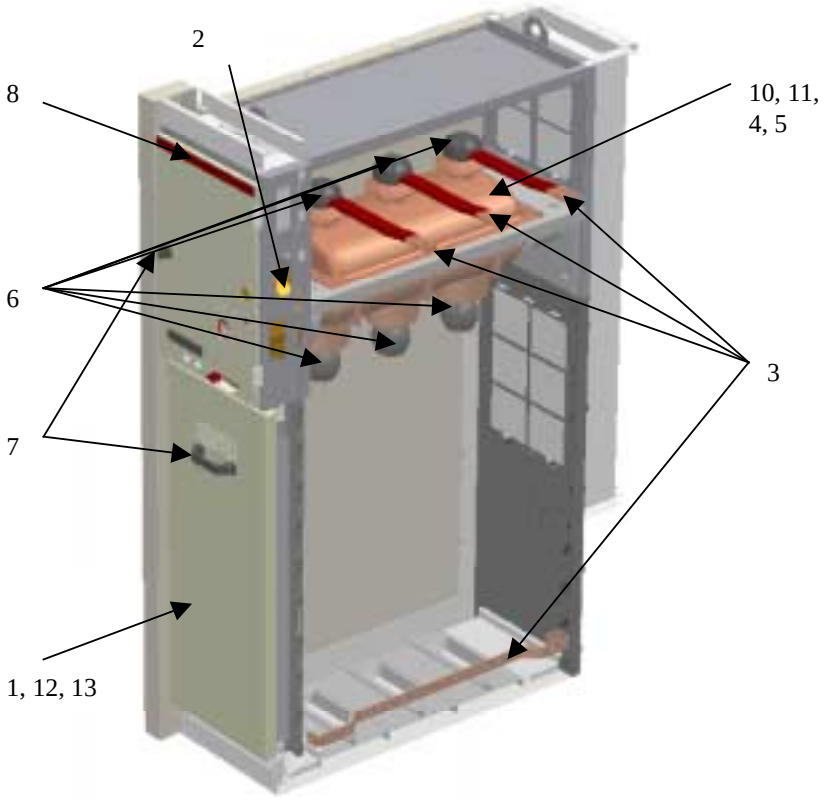
Data SDC				
Rated voltage	[kV]	12	17,5	24
Rated current	[A]	630	630	630
Rated short-time withstand current	[kA]	25	20	20
Rated duration of short circuit	[s]	1 or 2	1 or 3	1 or 3
Cubicle dimensions:				
Width	[mm]	375/500	=	=
Depth	[mm]	940+60	=	=
Height	[mm]	1635/1885	=	=

3.4 Use of a product

Switch-disconnector cubicle is mainly used as an incoming ring or branch cubicle. The basic unit is equipped with an SF6-insulated, 3-position switch-connector type SFG with its operation mechanism.

3.4 Main components in SDC

In the next picture *Cover parts* (no 1, 12, 13) covers all the sheet metal parts in SDC. Therefore numbering of Cover parts exist only once in the picture.



Picture 4. 3D-model of UniSwitch M1 SDC

Part No:	Name	Material	Weight / kg
1	Cover parts	Steel	89,7 kg
2	String device	Stainless steel	6,0 kg
3	Bushbars	Copper	7,6 kg
4	Bearings	Brass	0,4 kg
5	Window	Polycarbonate	0,9 kg
6	Field control cups	EPDM	0,7 kg
7	Handle	Polypropylene	0,1 kg
8	Adhesive labels	Polyester	0,1 kg
9	Window	Class	0,1 kg
10	Switch-disconnector	Epoxy	22,6 kg
11	Insulating gas	SF6-gas	0,2 kg
12	Cover parts	Zinc	0,5 kg
13	Cover parts	Aluminium	1,1 kg
14	Paint	INFRALIT type D polyesterpowder	0,8 kg
Total			**130,8 kg**

Table 1. Spreadsheet of materials used in UniSwitch M1

4. System boundaries

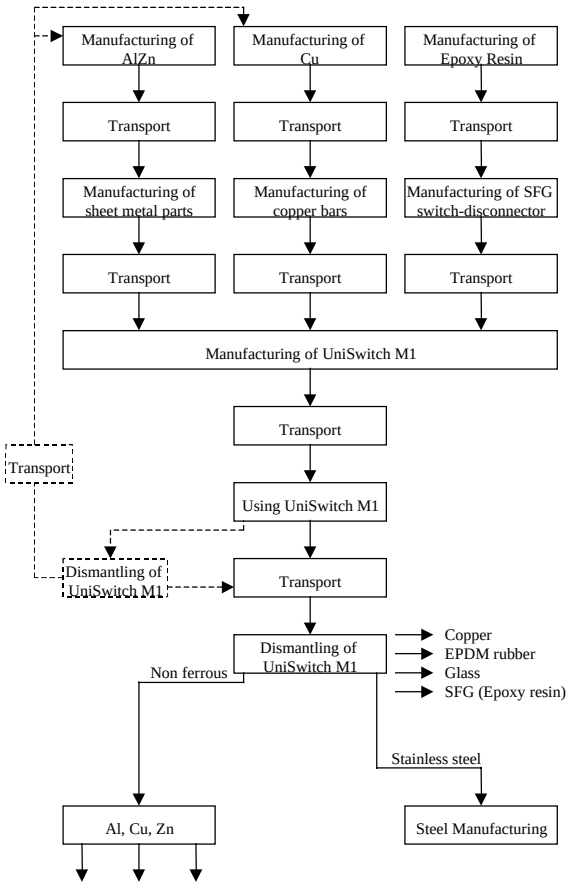
4.1 Criteria for inclusion and exclusion of the system

In this first step of EPD the main purpose was to produce a simplified study of the product. Input data was decided to be kept as minimal as possible. When skills and knowledge later grows the EPD will also grow to be more accurate.

Collection of data was started by collecting information of components and raw materials of the product. At the same time the transportation and the type of it were asked from each department which delivered components or facilities to our manufacturing. Only distance from the first supplier were accepted.

4.2 Flow-chart of system's boundaries

In this simplified flow-chart only few of main processes (boxes) and material flows (arrows) are presented. Processes and material flows with dashed line boxes and arrows are not necessarily done in real world and therefore those are not included in any of the calculations done. *Dashed line processes* happens only if default occures in the switch-disconnector or in some other devices.



Picture 5. Flow-chart of system's boundaries

5. Environmental performance

5.1 During manufacturing

Energy input during manufacturing is approximately 130 kWh per unit. There are no actual emissions to air, water and soil in our production.

5.2 During usage

There are no actual emissions during usage phase, that is if no electrical arc happens.

5.3 Recycling

Material	Gross-weight	Recycle %	Recy-clable	Landfill	Of total weig ht
Steel	89,7 kg	100,0 %	89,7 kg	0,0 kg	69 %
Stainless steel	6,0 kg	100,0 %	6,0 kg	0,0 kg	5 %
Copper	7,6 kg	100,0 %	7,6 kg	0,0 kg	6 %
Aluminium	1,1 kg	100,0 %	1,1 kg	0,0 kg	1 %
Brass	0,4 kg	100,0 %	0,4 kg	0,0 kg	0 %
Zinc	0,5 kg	100,0 %	0,5 kg	0,0 kg	0 %
Polycarbonate	0,9 kg	100,0 %	0,9 kg	0,0 kg	1 %
EPDM	0,7 kg	80,0 %	0,6 kg	0,1 kg	0 %
Polypropylene	0,1 kg	100,0 %	0,1 kg	0,0 kg	0 %
Polyester	0,1 kg	100,0 %	0,1 kg	0,0 kg	0 %
Glass	0,1 kg	98,0 %	0,1 kg	0,0 kg	0 %
Epoxy resin	22,6 kg	0,0 %	0,0 kg	22,6 kg	0 %
SF6-gas	0,2 kg	96,0 %	0,2 kg	0,0 kg	0 %
Paint	0,8 kg	0,0 %	0,0 kg	0,8 kg	0 %
Total	**130,8 kg**		**107,3 kg**	**23,6 kg**	

Table 2. Spreadsheet of UniSwitch M1 SDC's recyclable materials

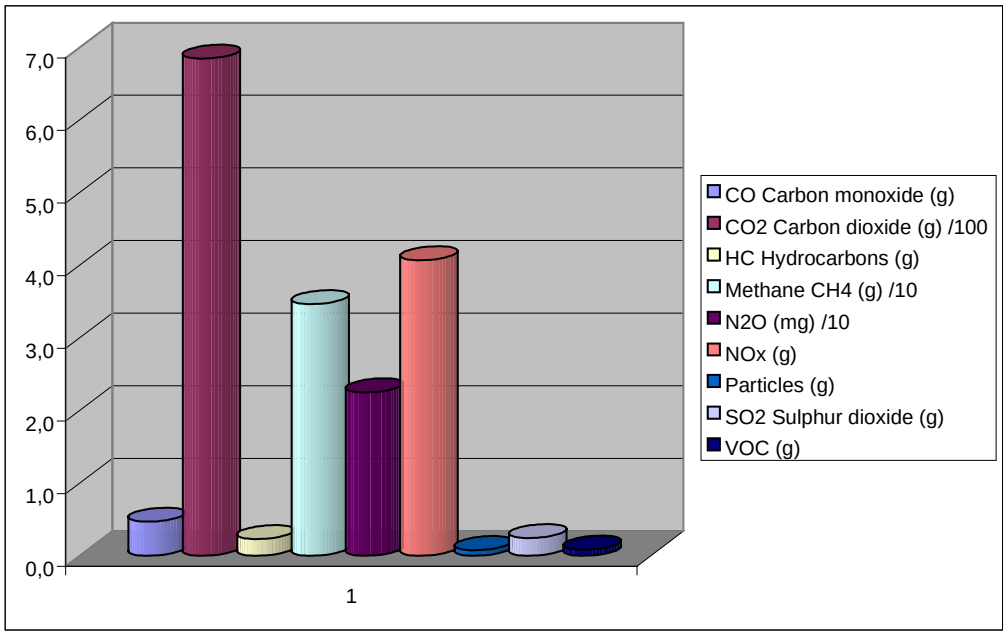
6. Life cycle analysis

6.1 Boundaries of UniSwitch's life cycle analysis

Starting values for calculating life cycle analysis are bounded to cover:

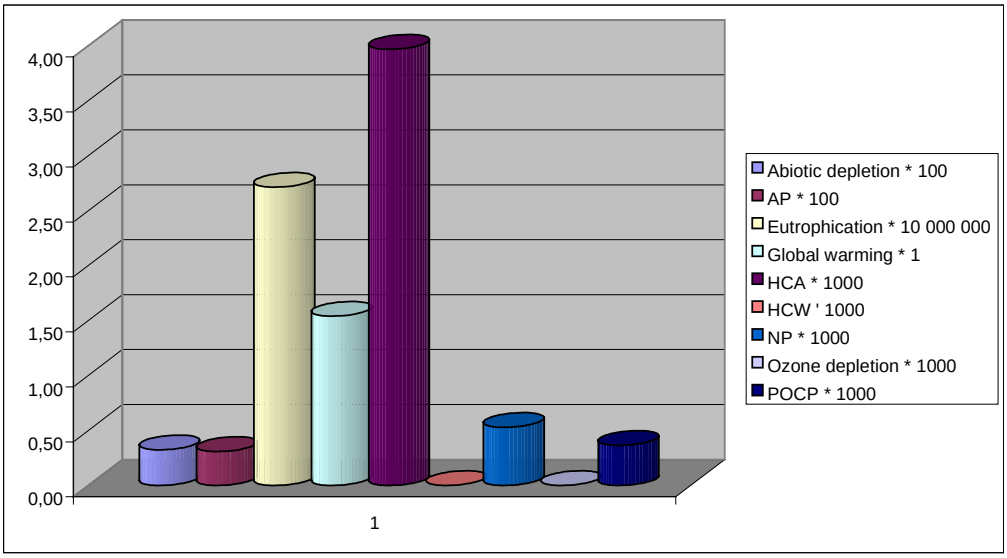
- raw materials including production wastes
- manufacturing of components including electric consuming
- painting of components
- product assemblies at ABB Transmit Oy including electric consuming
- transportation calculated as average distance (Switzerland, 2500 km)
- disposal (recycleable materials are recycled, other parts are landfilled)

6.2 Inventory reports



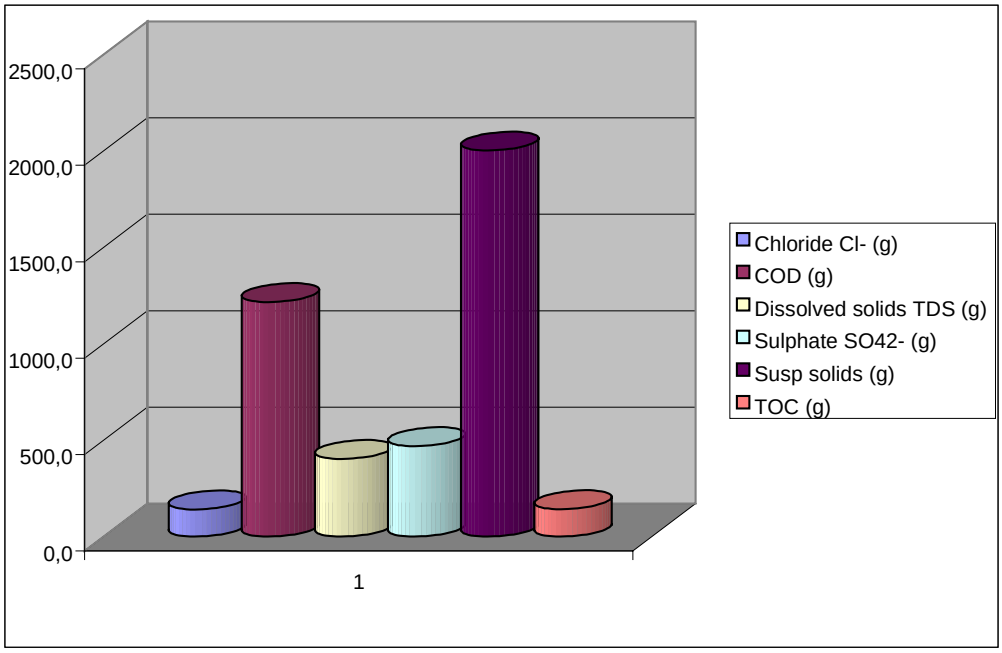
Picture 6. Invertory values

6.3 Classification reports

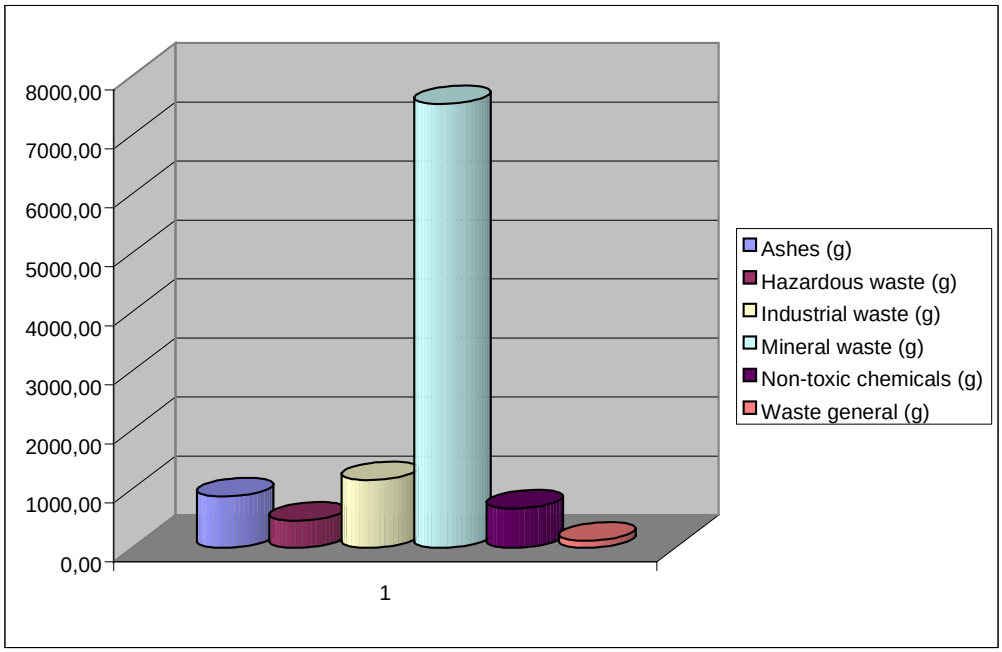


Picture 7. Clasification values

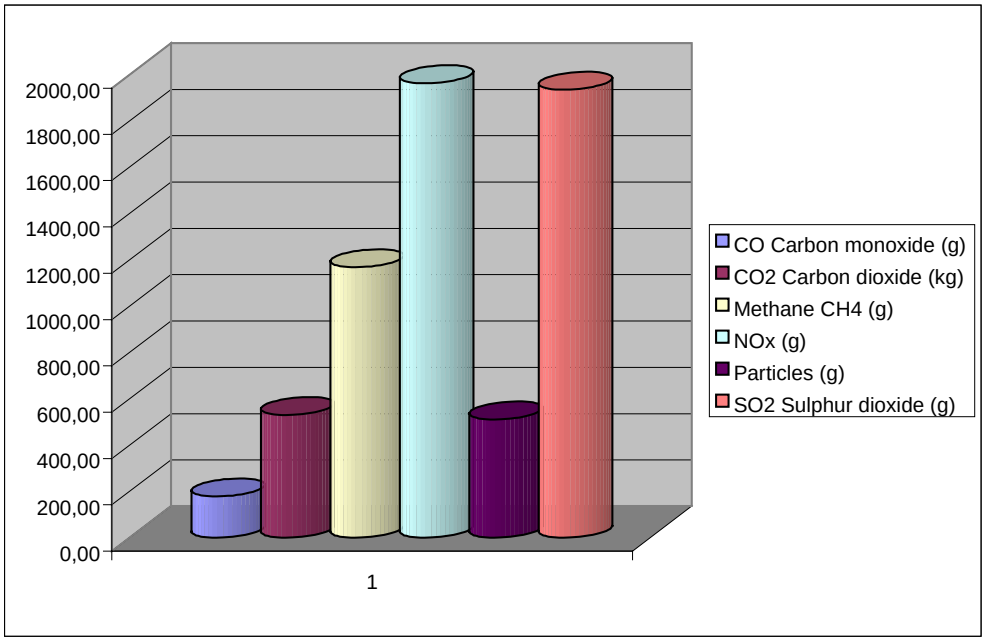
6.4 Analysis of emissions



Picture 9. Inventory values; emissions to water



Picture 10. Inventory values; emissions to ground



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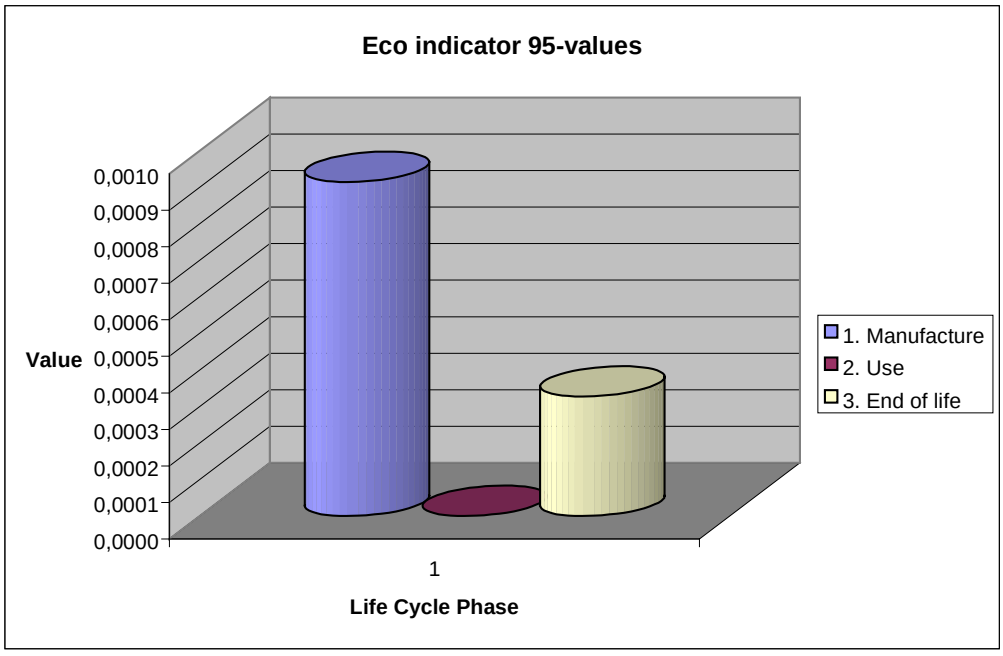
Picture 11. Inventory values; emissions to air

6.5 Summary of the results



Picture 8. EPS[3] values in different Life Cycle Phases.

[3] Environmental priority strategies

7. Information to customers

7.1 Decommissioning and recycling of materials

Environmental regulations differ from country to country and are quickly being developed. For this reason it is recommended that the local authorities are contacted for advice on disposal methods.

8. Critical review

As a final statement here could be said that more accurate studies must and are to be done in the near future. Like said before, this was our first step into the world of EPD study.

Biggest environmental impact seems to be coming from manufacturing. On usage phase there are no emissions, therefore no environmental impacts exists. There are only couple of cases where environmental load might exist during usage phase. First of them is when spare-part is needed, and the other one is when failure happens in switchgear or in driving device.

In the next version of this study the input data will be gathered in more detailed way. Boundaries will be set a bit wider, so the results of the study will also cover up bigger range of influences.

9. References

1. UniSwitch, Medium Voltage Switchgear, Installation manual – UNIS 7 GB
2. UniSwitch, Medium Voltage Switchgear, Instruction manual – UNIS 6 GB
3. UniSwitch, Medium Voltage Equipment – UNIS 12 GB
4. SF6 service for MV/HV equipment – ABB
5. Environmental Protection Guide – ABB Transmit Oy