Pump 3085.182

Certified Environmental Product Declaration (EPD)

1 The company

ITT Flygt AB is one of the world's leading manufacturers of submersible pumps and mixers. The company is represented in more than 130 countries by 40 wholly or partially owned sales companies, agents and distributors. The head office of the company is in Solna, outside Stockholm. ITT Flygt AB is a member of the ITT Industries Group.

The entire ITT Flygt organisation in Sweden is certified by DNV as conforming to ISO 14001, and has quality certification to ISO 9001:2000. The environmental product declaration has been drawn up in accordance with the provisions of "Requirements for certified environmental product declarations" EPD (MSR 1999:2).

2 The product

This document applies to pump 3085.182. The pump is designed mainly for operation in pump sumps, i.e. sewage pumping in pumping stations and/or sewage treatment plants. The pump has a hydraulic power of 1.29 kW and an overall efficiency of 56%. The average weight of the pump is 74 kg. The weight varies from around 50 kg to about 100 kg, depending on the model of pump casing, impeller, stator and rotor.

3 Environmental performance

In order to identify and quantify the significant environmental life cycle phase of Flygt products an generic LCA was carried out. The major findings of this LCA can be found in heading 4.

The data and calculations used conform with the "Product-Specific Requirements (PSR) – Submersible pumps and mixers" (PSR 2002:5).

3.1 Functional unit

The functional unit is defined as the hydraulic power of the pump at best efficiency point expressed in kW.

Material	kg	%*	kg/kW
Cast iron	52.8	70.9	40.9
Steel	8.72	11.7	6.76
Copper	3.18	4.25	2.46
Chloroprene rubber	2.97	3.99	2.30
Aluminium	2.35	3.16	1.82
Stainless steel	1.09	1.46	0.845
Oil	0.853	1.15	0.661
Zinc	0.240	0.322	0.186
Bronze	0.150	0.202	0.116
Brass	0.120	0.161	0.093
Parts not included**	1.98	2.66	1.54
Total	**74.4**	**100**	**57.7**

** by weight*

*** Weight on details that's not included in assessment*

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Table 1. Declaration of contents, with the quantity of every material specified as a proportion of the total pump weight in kg, and kg per functional unit.

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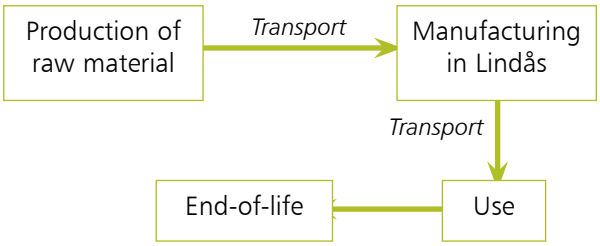
3.2 Allocation
The allocation factor for the environmental impact during the production phase is calculated as the ratio of the product weight to the total produced pump weight for the relevant factory during one year.

3.3 System boundaries
The system boundaries for the LCA that serves as a basis for this EPD is according to figure 1.

For End-Of-Life phase, environmental data only accounts for (generated) waste flows (i.e. no emissions).

fig 1



3.4 Manufacturing
The manufacturing phase extends from resource and energy extraction up to and including the finished product.

Since most of the ITT Flygt products are manufactured in Lindås, it is assumed that pump 3085.182 is manufactured there. The values for resource utilization, emissions to atmosphere or water, and waste generation caused by production have therefore been taken from the factory in Lindås.

The core of production is casting and machining of products, the components of which consist of cast iron, and the production of electric motors for the products. The environmental impact caused by subcontractors has not been included in the analysis.

3.5 Usage
The usage phase extends from distribution to the customer to waste management. The activities analyzed are transport, energy consumption and service. For service, only spare parts have been included in the analysis.

It is assumed that the pump is transported 1000 km by truck to the customer (the most comman route for the deliveries is between the factory in Lindås and the distribution centre in Metz, northern France).

The life cycle of waste water pumps is assumed to be 15 years and the pumps are assumed to be in operation for 3650 h/year.

It is assumed that service and maintenance work on the product will be carried out every three years. The following parts will then be changed on the pump: oil, bearings, seals, impeller, wear rings and motor cables.

3.6 Recovery
The materials recovered from pump 3085.182 are aluminium, chromium, copper, cast iron, steel, brass, nickel, zinc and plastics. This presupposes that the materials are handed in to a suitable recycling plant. During the recovery process in Sweden, the pump is first sent for initial clearance in which small electronic parts are removed. The pump is then sent for fragmentation in which it is broken up. Magnets, air currents, water baths and manual sorting are then used for separating the various materials.

According to the ITT Flygt recovery schedule for LCA, 10% of the pump material weight goes to landfill during end-of-life treatment. At a weight of 74 kg of pump 3085.182, this represents a weight of 7.4 kg that goes to landfill. The remaining material of the pump is assumed to be recycled.

3.7 Waste generated

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Waste generated	Quantity [kg]/pump	Quantity [kg]/[kW]
Swarf sold (for recovery)	4.54	3.52
Scrap sold (for recovery)	1.42	1.10
Total metal recovered	5.95	4.62
Hazardous liquid waste	0.48	0.37
Hazardous solid waste	0.15	0.12
Waste to landfill	0.98	0.76
Waste sorted at source, excl. swarf and scrap	2.56	1.98

Table 2. Waste from manufacturing, per pump and functional unit.

3.8 Resource utilization
Tables 3 and 4, on the next page, show the resources used during the pump production and utilization phases. The positive effects of end-of-life treatment have not been included.

3.9 Energy consumption
Table 5 and 6, on the next page, show the energy consumption during production and usage. Specific values for the factory in Lindås were used for the production phase. 100% of the electricity used in Lindås originates from hydro power. The EU, electricity generation mix 1998 (IEA 2000), is assumed to be used during the usage phase, which is a calculated mean value of the energy sources used in Europe for electricity generation.

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Non-renewable resources	kg/pump	kg/kW
Aluminium	3.03	2.35
Coal	105	81.5
Copper	3.40	2.64
Iron	84.3	65.3
Gravel	17.1	13.3
Nitrogen	4.32	3.35
Natural gas	16.6	12.8
Oil	43.1	33.4
Zinc	0.311	0.241
Renewable resources	per pump	per kW
Paper [kg]	0.421	0.327
Wood [kg]	0.926	0.717
Water [m^3]	0.329	0.255
Power consumption	kWh/pump	kWh/kW
Hydro power	137	106

Table 3. Resource consumption for one 3085.182 pump during the production phase (>0.3 kg).

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Non-renewable resources	kg/pump	kg/kW
Aluminium	0.658	0.510
Coal	13 100	10 100
Copper	5.34	4.14
Iron	123	95.1
Gravel	164	126
Nitrogen	16.6	12.9
Natural gas	1 510	1 170
Oil	1 360	1 060
Sodium salt	5.23	4.05
Uranium	0.560	0.434

Table 4. Resource consumption for one 3085.182 pump during the usage phase. No renewable resources are used during this phase (>0.5 kg).

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Usage phase		
Energy source	Energy lost [kWh]/pump	Energy lost [kWh]/hydraulic power [kW]
Natural gas and coal-fired and oil-fired condensing power stations	28 600	22 200
Nuclear power	19 700	15 200
Hydro power	6 740	5 220
Total	55 000	42 700

Table 5. Energy consumption for one 3085.182 pump. The amount of energy lost is the energy consumed minus the useful hydraulic energy.

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Production phase		
Energy source	Net energy consumed [kWh]/pump	Net energy consumed [kWh]/hydraulic power [kW]
Electricity (100% hydroel. power)	130	101
District heating	29.4	22.8
Oil	0.137	0.106
LP gas	5.88	4.56
Total	165	128

Table 6. Energy consumption for one 3085.182 pump during the production phase.

3.10 Emissions

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Environmental impact category	Production	Usage	Total life cycle
Acidification			
[mol H+ equiv./pump]	0.0345	5.68	5.72
[mol H+ equiv./kW]	0.0267	4.41	4.43
Eutrophication			
[kg O2 equiv./pump]	1.98	312	314
[kg O2 equiv./kW]	1.54	242	244
Global warming potential (GWP)			
[kg CO2 equiv./pump]	114	29900	30000
[kg CO2 equiv./kW]	88.7	23200	23300
Ozone depletion			
[kg CFC equiv./pump]	0.0003	0.0542	0.0545
[kg CFC equiv./kW]	0.0002	0.0420	0.0422
Photochemical oxidants			
[kg POCP equiv./pump]	0.0724	5.85	5.92
[kg POCP equiv./kW]	0.0561	4.53	4.59

Table 7. Pollutant emissions expressed in terms of potential environmental impact.

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Emissions to air Production	kg/ pump	kg/ kW
SOx	2.88E+00	2.24E+00
NOx	7.90E-01	6.12E-01
Cadmium	7.51E-05	5.82E-05
Chromium	7.73E-04	5.99E-04
Mercury	1.93E-05	1.50E-05
Nickel	0	0
Lead	6.00E-03	4.65E-03
Zinc	0	0
Usage	**kg/ pump**	**kg/ kW**
SOx	1.44E+02	1.12E+02
NOx	4.98E+01	3.86E+01
Cadmium	5.43E-04	4.21E-04
Chromium	3.25E-03	2.52E-03
Mercury	1.71E-03	1.33E-03
Nickel	0	0
Lead	1.30E-02	1.01E-02
Zinc	0	0

Table 8. Emissions to air during the production and usage phase.

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Emissions to water Production	kg/ pump	kg/ kW
Cadmium	1.02E-05	7.91E-06
Mercury	5.57E-08	4.32E-08
Lead	1.02E-03	7.91E-04
Chromium	1.44E-03	1.12E-03
Nickel	7.25E-04	5.62E-04
Zinc	1.86E-03	1.44E-03
Usage	**kg/ pump**	**kg/ kW**
Cadmium	5.97E-06	4.63E-06
Mercury	2.59E-05	2.01E-05
Lead	7.70E-02	5.97E-02
Chromium	1.31E-01	1.02E-01
Nickel	4.20E-04	3.26E-04
Zinc	1.36E-01	1.05E-01

Table 9. Emissions to water during the production and usage phase.

4. Miscellaneous

The life cycle assessment shows that the copper wire of the stator winding and the copper in the motor cable account for most, i.e. 71%, of the total environmental impact of the analyzed parts. According to the EPS methodology, most of the environmental impact, i.e. 97%, of the pump occurs during the usage phase.

For further information concerning the Environmental product declaration, explanation of the definitions and concepts, and general information concerning related environmental matters, see www.miljostyrning.se (Swedish Environmental Management Board).

Information on the company's environmental work are available from the homepage www.flygt.com, or can be ordered directly from us. Please contact our ESH-coordinator at fsd@flygt.com or at:

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4.1 Time of validity

The environmental product declaration which has been reviewed and approved by Det Norske Veritas Certification AB according to PSR 2002:5 and MSR 1999:2 is valid up to and including 2007-02-04.

Registration number: S-P-00062

4.2 Accredited Certification body

Det Norske Veritas Certification AB
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SE-104 25 Stockholm, Sweden
Phone: +46 8 587 940 00, Fax: +46 8 651 70 43

5. References

- Product-Specific Requirements (PSR) - Submersible pumps and mixers. PSR 2002:5, version 1.0 (4 October 2002, revised 2004-01-20).
- Requirements for certified environmental product declarations, EPD - Swedish application of ISO TR 14025 Type III environmental declarations, MSR 1999:2. Svenska Miljöstyrningsrådet (27 March 2000).
- ISO TR 14025, Environmental labels and declarations - Type III environmental declarations - Guiding principles and procedures.
- Simplified environmental reporting 2001 - ITT Flygt factory in Emmaboda.
- Generell LCA för dränkbara pumpar och omrörare, exemplifierad av pump 3085.182. Confidential LCA report available by special permission, Flygt AB, 2003-12-10.
- A systematic approach to environmental priority strategies in products development (EPS). Version 2000 – Models and data. Steen, B., CPM report 1999:5, Chalmers University of Technology, Gothenburg, Sweden 1999.
- Energy statistics of OECD countries 1997-1998. IEA Statistics, ISBN 92-64-05914-8, page II.300, Edition 2000.