

**Final Report - Annex X**

## **Evaluation of Environmental Product Declaration Schemes**

European Commission  
DG Environment

September 2002

Annex X

## Examples of EPDs under the different schemes

The following examples of EPDs under the different EPD schemes described in the Final Report and Annexes are available.

1. Volvo Car Corporation

See website: <http://epd.volvocars.se> for more information.

2. Volvo Trucks

See example declaration on page 4

3. AISE

See: [www.aise-net.org/PDF/PWCProgressReport\\_99\\_00.pdf](http://www.aise-net.org/PDF/PWCProgressReport_99_00.pdf) and [www.aise-net.org/PDF/AISEProgressReport\\_99\\_00.pdf](http://www.aise-net.org/PDF/AISEProgressReport_99_00.pdf) for more information.

4. AUB

See website: <http://www.baunetz.de/arch/aub/> for more information.

5. AIMCC

No examples found.

6. MRPI

See example declaration on page 12.

7. SIA

See example declaration on page 14

8. BRE

See website: <http://www.bre.co.uk/envprofiles> for more information.

9. RTS

See website: <http://www.rts.fi/ymparistoselosteet/selostelista.htm> for more information (in Finnish).

10. NITO

See example declaration on page 16

11. EPDS

No examples found.

12. Paper profile

See example declaration on page 20

13. IVN

See website: [www.naturtextil.com](http://www.naturtextil.com) for more information.

14. Italian EPD scheme

See example declaration on page 21

15 Japanese EPD scheme

See website: <http://www.jemai.or.jp/ecolabel> for more information.

16. Korean EPD scheme

No examples found.

17. Swedish EPD scheme

See example declaration on page 32

# ENVIRONMENTAL PRODUCT DECLARATION

Volvo FH12 and Volvo FM12, Euro 3



**VOLVO**

“Every new product must have a lower environmental impact than the one it replaces”

**E**nvironmental care is one of Volvo's core values and proactive environmental programmes are essential to the achievement of long-term progress in the area. Our aim is to ensure that every new product has a lower environmental impact than the one it replaces. Emissions of nitrogen oxides, carbon monoxide, hydrocarbons and particulates from Volvos trucks have been cut by 60-85% since the mid-1970s, and a further reduction of two-thirds should be achievable over the next decade. At the same time, the vehicles will become increasingly fuel-efficient, which will reduce emissions of carbon dioxide.

### **Environmental product declarations describe environmental impact**

Volvo has developed a system of environmental product declarations (EPDs), which describe the life-cycle environmental impact of the truck in an open and factual manner. The purpose of an EPD is to enable customers and transport buyers to evaluate the environmental impact of different

products. In this context, it serves as a valuable tool, not least for those concerned to promote the development of a better environment by making a proactive choice of transport solution. This EPD describes the environmental impact of the European-built Volvo FH and FM models.



Efficient commercial transport is a basic prerequisite to growth and development. In this context, the truck has assumed an increasingly important role with the growth in demand for the fast, safe and economical transport of highly refined goods. Emissions from road traffic in the EU have been reduced by aggressive legislation, combined with the introduction of new, cleaner fuels and engines. As an example, nitrogen oxides emissions were cut by one-third between 1990 and 2000, despite an increase of over 20% in traffic volumes.

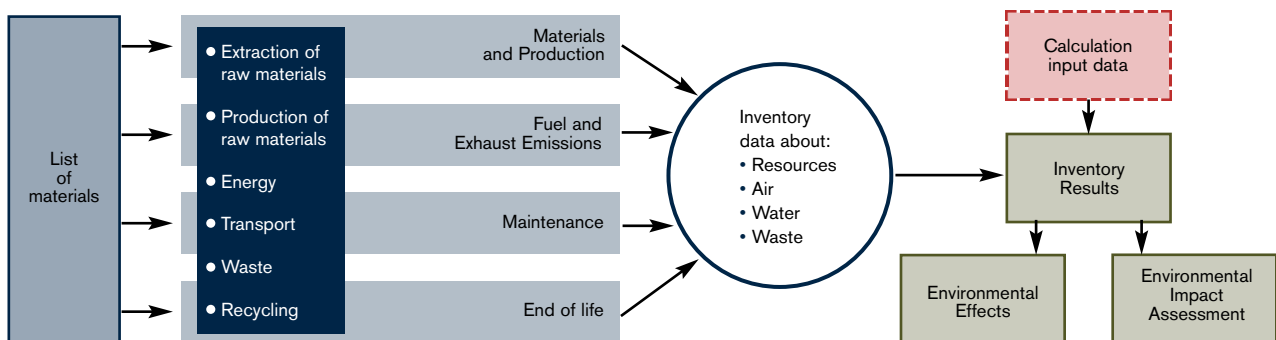
The EPD system covers all phases in the life cycle of a truck, from production of the raw materials to final disposal and recycling, and provides information on the environmental impact of each. The system is large and complex, and approximations have been made in some cases. The results should serve as a guide to some of the more important environmental parameters in the life cycle of the product.

**The Volvo Trucks EPD system is divided into four sections:**

- **Materials and production** deals with the environmental impact of raw materials production, manufacturing operations at Volvo Truck plants in Europe, production at suppliers' plants and transport.
- **Fuel and exhaust emissions** deals with the environmental impact of exhaust emissions based on certification tests for each specified engine type. Due to differences in individual conditions, the actual emissions from a truck may differ from those indicated by the results.
- **Maintenance** deals with the environmental impact (based on average values) of the use of consumables and materials in preventive maintenance and parts production.
- **End of life** deals with the environmental impact of product disposal, waste management and the recycling of truck materials.

**The results are presented under three different headings:**

- Inventory results, including data on resources and emissions for 22 parameters.
- Environmental effects, such as greenhouse effect, acidification potential and ozone depletion potential.
- Environmental impact assessment using EPS (Environmental Priority Strategies in product development).



**Calculation based on typical values**

The EPD results vary considerably depending on the input data, the most important of which are fuel consumption, mileage, engine type and fuel grade. The results presented in this EPD are based on typical values for a long-haul Volvo FH or Volvo FM 4x2 tractor over its entire life cycle. It should be noted that the fuel consumption, mileage and grade of fuel may vary significantly depending on the operation of the individual truck.

**Make your own calculation**

The Volvo Trucks EPD online calculation site at [www.volvo.com/trucks](http://www.volvo.com/trucks) (choose Volvo Trucks, Customer Offers) enables users to perform their own calculations. Depending on the input data, the user can obtain information on the environmental impact of a single transport movement, the complete truck life cycle or a comparison between two alternatives. The site also provides more detailed information on the parameters, the method of calculation and the EPD results.

## CALCULATION INPUT DATA

Volvo FH12 and Volvo FM12, Euro 3

The EPD results are based on the following input data (EPD system version 1.4):

Truck model	Emission level	Type of engine	Type of fuel	Exhaust filter	Distance [km]	Fuel consumption [litre/100 km]
<b>Volvo FH and Volvo FM</b>	<b>Euro 3</b>	<b>12L</b>	<b>*MK1 (Cert fuel)</b>	<b>No</b>	<b>1,000,000</b>	<b>31</b>

\* Low sulphur diesel <10 ppm

## INVENTORY RESULTS

	Unit	Materials and Production	Fuel & Exhaust Emissions	Maintenance	End of Life	Total
<b>Resources</b>						
			MK1 (Cert fuel)			
Electricity, renewable	MWh	6		0	0	7
Electricity, non renewable	MWh	11		0	0	11
Other renewable energy	MWh	1		0	0	1
Other non renewable energy	MWh	58		11	-14	56
Fuel	Litre		310,000			310,000
Materials	Kg	6,700		2,562	-5,648	3,614
<b>Air</b>						
CO	Kg	112	713 (744)	8	-83	751
CO <sub>2</sub>	Kg	14,500	806,000 (837,000)	1,490	-4,690	817,300
HC (VOC)	Kg	34	248 (248)	30	-1	312
NO <sub>x</sub>	Kg	41	5,270 (5,890)	6	-4	5,313
SO <sub>2</sub>	Kg	36	1 (52)	7	-7	37
PM (Particulate matter)	Kg	12	62 (93)	4	-6	72
CFC (R11 & R12)	Kg	0		0	0	0
HCFC (R22)	Kg	0		0	0	0
<b>Water</b>						
Use of water (cooling excl)	m <sup>3</sup>	72		2	7	81
Use of water (cooling)	m <sup>3</sup>	125		0	0	125
BOD	Kg	4		0	0	4
COD	Kg	12		0	0	12
<b>Waste</b>						
Waste, treated	Kg	3,361		264	82	3,707
Waste, to landfill	Kg	13,977		42	670	14,668
Hazardous waste, treated	Kg	214		63	51	328
Hazardous waste, to landfill	Kg	60		7	-17	50

## ENVIRONMENTAL EFFECTS

	Unit	Materials and Production	Fuel & Exhaust Emissions	Maintenance	End of Life	Total
<b>Greenhouse Effects - GWP</b>						
(CO <sub>2</sub> equivalents)	kg	15,395	1,022,095 (1,057,497)	1,886	-4,896	1,034,481
<b>Acidification Potential</b>						
(SO <sub>2</sub> equivalents)	kg	64	4,967 (5,452)	12	-10	5,033
<b>Ozone Depletion Potential</b>						
(CFC11 equivalents)	kg	0.0	0.0 (0.0)	0.0	0.0	0.0

## LIST OF MATERIALS

A list of materials, totalling 6,700 kg in weight, equivalent to those used in a Volvo FH or Volvo FM 4x2 tractor, was used as a basis for the EPD calculations. Over one-third (37 % by weight) of the materials used in a new truck is derived from recycled material.

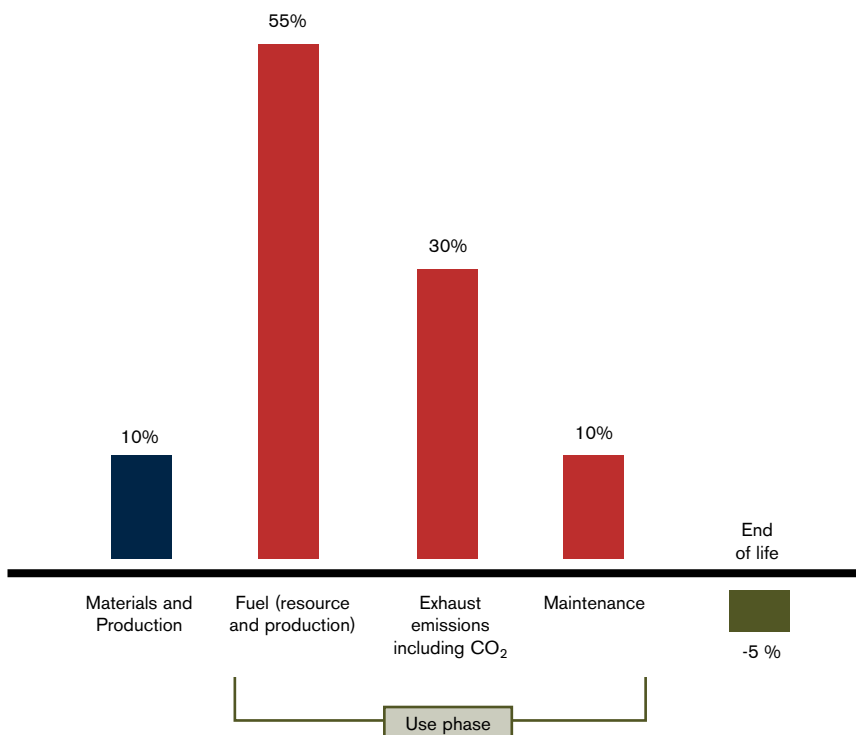
Material	Kg	From recycled material
<b>Iron</b>		
Wrought	1,630	50%
Cast	1,450	97%
<b>Sheet steel</b>		
Hot-rolled	1,853	
Cold-rolled	418	
<b>Other metals</b>		
Aluminium	215	90%
Lead (battery)	65	50%
Copper	30	40%
Brass	20	86%
Stainless steel	5	80%
<b>Plastics</b>		
Thermoplastics	210	
Thermosetting plastics	120	
<b>Other materials</b>		
* Rubber	375	
Glass	45	
Textile	35	
Paint	40	
Brake pads	30	
Oil grease	60	
Electronics	30	
Sulphuric acid (battery)	25	
Bitumen	10	
Wood	10	
Cooling agent (R134a)	2	
Glycol	22	
<b>Total</b>	<b>6,700</b>	<b>37%</b>

\* The trucks are delivered with low content PAH (Polycyclic aromatic hydrocarbons) type of tyre treads

Evaluation of the life-cycle environmental impact of a product enables a judgement to be made as to where efforts to improve overall environmental performance should be directed. Although this evaluation may be qualitative, methods and tools for quantifying environmental impact are also available.

### The EPS system

One example is the EPS (Environmental Priority Strategies in product development) tool used by Volvo. EPS is based on the following five 'safeguard subjects' and on society's willingness to bear the cost of correcting changes in them. The subjects are human health, ecosystem production capacity, natural resources, biodiversity and esthetical values. The environmental load or impact of each activity or process forming part of the life cycle is expressed in environmental load units (ELUs) and the total environmental impact can then be calculated. The graph below shows the distribution of the life-cycle environmental impact of a Volvo heavy truck as determined using the EPS method.



Distribution of the environmental impact from a Volvo heavy truck according to the evaluation method EPS.

### **Consumption of fuel**

The greater proportion of the life-cycle environmental impact of a truck is generated during the vehicle's useful life. EPS shows that the production and consumption of diesel fuel has the greatest environmental impact, since this is a limited resource. Exhaust emissions, including CO<sub>2</sub>, also have a major impact.

The quantity of fuel required to transport a given load from one place to another is dependent on a number of factors, such as the chosen route, the load factor, the driver and the weather conditions – and, of course, the design of the vehicle and engine. Volvo Truck Corporation is working continuously to develop engines and vehicles which are more fuel-efficient. Another important product is the Dynafleet transport information system, which affords fast, reliable communication between fleet control centre and truck, and is used to supply the driver with traffic information. Drivers and owners can also influence the fuel consumption by ensuring that their vehicles are set up and maintained correctly. Although correct tyre pressure and properly adjusted air deflectors help to reduce fuel consumption, speed and driving technique play an even greater role.

### **ISO 14001 certification**

Although manufacturing operations account for a lower proportion of a truck's environmental impact, they may be highly important to people living in the vicinity of a production plant. All plants producing Volvo FH and Volvo FM trucks in Europe have implemented environmental management systems in accordance with ISO 14001 or EMAS. Volvo Truck Corporation's engine and power train development functions are other major units which have been awarded ISO 14001 certification.

**VOLVO**

**Volvo Truck Corporation**  
Göteborg, Sweden  
[www.volvo.com](http://www.volvo.com)

## BEDRIJFSINFORMATIE



CVK Kalkzandsteen  
Utrechtseweg 38  
Postbus 23  
1200 AA HILVERSUM

## VOOR

CVK Kalkzandsteen stenen en blokken

## MRPI-code

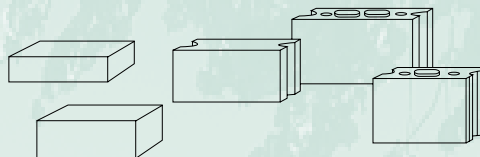
2.2 00013.001

## DATUM VAN AFGIFTE

19 november 1999

## ANALYSE EENHEID

1000 kg CVK Kalkzandsteen stenen en blokken



## PRODUCTOMSCHRIJVING

Kalkzandsteen is een bouwproduct dat wordt gemaakt van zand, kalk en water. Na het mengen van de grondstoffen en een vormgevingsproces, vindt de verharding plaats in een autoclaaf met stoom van 200°C. Kalkzandsteen stenen en blokken worden vooral toegepast in de woning- en utiliteitsbouw in dragende en niet-dragende binnen- en buitenwanden.

## MILIEUPROFIEL

Thema	Eenheid	Productie	Transport naar de bouwplaats	Gebruik (opname CO <sub>2</sub> )	Afvalverwerking	Totaal
Uitputting abiotische grondstoffen	-	1,5 10 <sup>-13</sup>	6,6 10 <sup>-15</sup>	0,0	1,0 10 <sup>-14</sup>	1,7 10 <sup>-13</sup>
Uitputting biotische grondstoffen	jr <sup>-1</sup>	0,0	0,0	0,0	0,0	0,0
Broeikaseffect	kg	8,8 10 <sup>1</sup>	2,6	-3,7 10 <sup>1</sup>	3,4	5,7 10 <sup>1</sup>
Aantasting ozonlaag	kg	1,4 10 <sup>-6</sup>	0,0	0,0	9,2 10 <sup>-8</sup>	1,5 10 <sup>-6</sup>
Verzuring	kg	8,6 10 <sup>-2</sup>	3,1 10 <sup>-2</sup>	0,0	3,3 10 <sup>-2</sup>	1,5 10 <sup>-1</sup>
Vermesting	kg	1,1 10 <sup>-2</sup>	5,0 10 <sup>-3</sup>	0,0	5,2 10 <sup>-3</sup>	2,1 10 <sup>-2</sup>
Humane toxiciteit	kg	1,2 10 <sup>-1</sup>	3,5 10 <sup>-2</sup>	0,0	3,8 10 <sup>-2</sup>	1,9 10 <sup>-1</sup>
Ecotoxiciteit	m <sup>3</sup>	3,7 10 <sup>2</sup>	7,3 10 <sup>-1</sup>	0,0	1,1 10 <sup>2</sup>	4,8 10 <sup>2</sup>
Fotochemische oxidantvorming	kg	1,6 10 <sup>-2</sup>	3,8 10 <sup>-3</sup>	0,0	4,1 10 <sup>-3</sup>	2,4 10 <sup>-2</sup>

## MILIEUMATEN

Thema	Eenheid	Productie	Transport naar de bouwplaats	Gebruik (opname CO <sub>2</sub> )	Afvalverwerking	Totaal
Grondstoffen	jr <sup>-1</sup>	1,4 10 <sup>-13</sup>	5,9 10 <sup>-15</sup>	0,0	9,2 10 <sup>-15</sup>	1,5 10 <sup>-13</sup>
Energie	MJ	6,9 10 <sup>2</sup>	3,7 10 <sup>1</sup>	0,0	6,1 10 <sup>1</sup>	7,9 10 <sup>2</sup>
Emissies	jr <sup>-1</sup>	3,6 10 <sup>-11</sup>	7,3 10 <sup>-12</sup>	-6,9 10 <sup>-12</sup>	7,9 10 <sup>-12</sup>	4,4 10 <sup>-11</sup>
Afval - niet gevaarlijk	kg	1,0	1,7 10 <sup>-3</sup>	0,0	1,9 10 <sup>1</sup>	2,0 10 <sup>1</sup>
Afval - gevaarlijk	kg	1,1 10 <sup>-1</sup>	4,1 10 <sup>-3</sup>	0,0	8,1 10 <sup>-3</sup>	1,2 10 <sup>-1</sup>

## MILIEUPROFIEL EN MILIEUMATEN

### Representatief voor:

Alle CVK Kalkzandsteen stenen en blokken geproduceerd in Nederland, met uitzondering van gevelsteen.

### Opmerkingen:

De weergegeven getallen zijn het gewogen gemiddelde van de 11 fabrieken van CVK Kalkzandsteen.

## LEVENSFASEN

In het milieuprofiel en de milieumaten zijn de volgende levensfasen opgenomen:

- winning en opwerking van de grondstoffen
- transport van grondstoffen naar de productielocaties
- productie van stenen en blokken
- transport naar de bouwplaats
- opname van CO<sup>2</sup> tijdens de gebruiksfase
- afvalverwerking na toepassing

## OVERIGE LEVENSFASEN EN BENODIGDE MATERIALEN EN PROCESSEN

In het milieuprofiel en de milieumaten zijn de volgende levensfasen niet meegenomen:

- het verwerken van het product op de bouwplaats
- overig gebruik en onderhoud
- sloop

## KWALITATIEVE INFORMATIE

- alle fabrieken van CVK Kalkzandsteen beschikken over een ISO 9002 kwaliteitssysteemcertificaat en een KOMO productcertificaat.
- tijdens de gebruiksfase is de uitloging uit kalkzandsteen verwaarloosbaar klein. CVK Kalkzandsteen stenen en blokken voldoen daarmee aan de eisen van categorie 1, type-A toepassingen van het Bouwstoffenbesluit.
- bouw- en slooppuin van stenen en blokken wordt door breekinrichtingen verwerkt en als component van menggranulaat toegepast in de grond-, weg- en waterbouw. Er is daarbij uitgegaan van 1% stort. De invloed van een verhoging van dit percentage naar 5% op de milieumaat afval is groter dan 20%. Het gekozen afvalscenario is echter afgestemd met alle overige brancheverenigingen van producenten van steenachtige bouwmaterialen en met de BRBS.

## OVERIGE BEDRIJFSINFORMATIE

Voor nadere informatie over dit MRPI blad en milieu-aspecten van kalkzandsteen kunt u terecht bij:

Research Centrum Kalkzandsteen

Drs. H.M.L. Schuur

Postbus 343

1200 AH HILVERSUM

tel. : 035 - 6250280

fax : 035 - 6250285

e-mail : [hsc@cvk.nl](mailto:hsc@cvk.nl)

internet : [www.cvk.nl](http://www.cvk.nl)

**Allgemeine Angaben**

 Deklariert von: Hans Zogg  
 Klassierung: SIA 2001 / 1.1

		Flumroc-Dämmplatte 1	Flumroc-Dämmplatte SOLO	Flumroc-Dämmplatte TRIA	Flumroc-Dämmplatte DUO	Flumroc-Dämmplatte EUROC	Flumroc-Dämmplatte 3	Flumroc-Dämmplatte ECCO
<b>Festlegung des Deklarationsbereichs</b>								
Verbundmaterialien wie Kaschierungen usw. als feste Bestandteile des Produktes			keine	keine	keine	keine		
als Produktevariante erhältlich		X					X	X
separat nach 493.14 deklariert		X					X	X
<b>Physikalische Merkmale</b>								
Rohdichte	kg/m <sup>3</sup>	ca. 32	ca. 32	ca. 32	ca. 50	ca. 50	ca. 60	ca. 75
Masse pro Fläche	kg/m <sup>2</sup>	0.9 - 6.4	3.2 - 5.8	3.2 - 5.8	3.0 - 10.0	6.2 - 7.5	1.8 - 7.2	2.2 - 9.0
<b>Herstellung</b>								
Zusammensetzung (Summe 100 Massen %)								
Nachwachsende Rohstoffe		keine	keine	keine	keine	keine	keine	keine
Mineralische Stoffe therm. hergestellt:								
- Primärrohstoff (Massen %)		92.0	92.0	92.0	92.0	91.5	92.0	91.5
- Rezyclat (Massen %)		6.0	6.0	6.0	6.0	6.0	6.0	6.0
Kunststoffe und ähnliche Stoffe <sup>1)</sup>		2.0	2.0	2.0	2.0	2.5	2.0	2.5
<b>Lösungsmittlemissionen</b>								
Verklebung der Verbundmaterialien		keine	keine	keine	keine	keine	keine	keine
<b>Graue Energie</b>								
Kumulierter Primärenergiebedarf pro Masseneinheit	MJ/kg	17.15	17.15	17.15	17.15	17.15	17.15	17.15
Anteil erneuerbarer Energie	%	5	5	5	5	5	5	5
<b>Verarbeitung</b>								
Lungengängige Fasern		bei allen Produkten: in Spuren vorhanden						
<b>Nutzung</b>								
Oekologisch und toxikologisch relevante Bestandteile		keine	keine	keine	keine	keine	keine	keine
<b>Entsorgung</b>								
Verwertbarkeit		Rücknahme und Verwertung garantiert (Rücknahmebedingungen beim Hersteller erhältlich) gilt für alle Produkte						
Schadstoffgehalt von zu verbrennenden Bauprodukten		nicht relevant, da nicht brennbar (gilt für alle Produkte)						
Deponietyp (gemäss TVA) Inertstoffdeponie		X	X	X	x	X	X	X

 Zusätzliche verfügbare Information: Graue Energie gemäss  
 Büro für Umweltchemie Zürich  
 (Stand 29.03.01)

<sup>1)</sup> Modifiziertes Phenolharz

<sup>2)</sup> je nach Schütthöhe

<sup>3)</sup> je nach Stopfdichte

<sup>4)</sup> Alufolie abziehen und dem Alurecycling zuführen



Flumroc-Dämmplatte TOPA	Flumroc-Dämmplatte NOVA	Flumroc-Bodenplatte	Flumroc-Dämmplatte IGLU	Flumroc-Dämmplatte PRIMA	Flumroc-Dämmplatte EUROTHERM	Flumroc-Dämmplatte 341	Flumroc-Dämmplatte MEGA	Flumroc-Feingranulat	Flumroc-Lamellmatte FML 250	Flumroc-Isoliermatte FMI 400	Flumroc-Brandschutzmatte FMI 500	Flumroc-Brandschutzplatte FPI 700	Flumroc-Stopfwoolle FLB 700
X					keine			keine					
X	X	X	X	X		X	X		X	X	X	X	
X	X	X	X	X		X	X		X	X		X	X
ca. 85 4.2 - 8.5	ca. 90 7.2 - 18.0	ca. 100 1.5 - 2.5	ca. 110 3.3 - 5.5	ca. 120 7.2 - 24.0	ca. 120 12.0 - 24.0	ca. 150 4.5 - 7.5	ca. 160 9.6 - 19.2	90 - 120 -2)	ca. 32 0.6 - 1.6	ca. 45 2.7 - 5.4	ca. 80 2.4 - 8.0	ca. 120 3.6 - 7.2	100 - 170 -3)
keine	keine	keine	keine	keine	keine	keine	keine	keine	keine	keine	keine	keine	keine
90.8	90.8	91.5	90.8	90.8	90.8	90.8	90.8	92.0	91.5	92.4	93.3	93.3	93.5
6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0	6.0
3.2	3.2	2.5	3.2	3.2	3.2	3.2	3.2	2.0	2.5	1.6	0.7	0.7	0.5
keine	keine	keine	keine	keine	keine	keine	keine	keine	keine	keine	keine	keine	keine
17.15 5	17.15 5	17.15 5	17.15 5	17.15 5	17.15 5	17.15 5	17.15 5	17.15 5	17.15 5	17.15 5	17.15 5	17.15 5	17.15 5
keine	keine	keine	keine	keine	keine	keine	keine	keine	keine	keine	keine	keine	keine
X	X	X	X	X	X	X	X	X	X <sup>1)</sup>	X <sup>1)</sup>	X <sup>1)</sup>	X	X

# ECO Declaration

(DK, NO, SE)

Model: 2074	Brand: S/390	
Product type: Server	Manufacturer: IBM Corporation	
Capacity: Model: 2074-001 Microprocessor-Coppermine 733/133/256KB Memory - 128MB PC133 SDRAM	Product size/weight: <b>13.3</b> cm height <b>41.4</b> cm width <b>66.0</b> cm depth <b>27.2</b> kg	
Manufacturer's representative: Lars Bjälkvall	Contact person: Lars Bjälkvall	
Postal address: Isafjordsgatan 39	Postal code: 16492	City: Stockholm
Telephone: +46 8 793 4070	Mobile phone:	
Telefax: +46 8 793 1020	e-mail: bjaelkv@se.ibm.com	
Additional information		

Any comparison between different products and their environmental attributes is simplified if the product characteristics are defined in similar and standardised ways. Swedish IT-Companies' Organisation (former SITO) in Sweden, Norwegian Office and IT-companies Organisation (KDL) in Norway and IT-Brancheforeningen Kontor & Data (ITB) in Denmark have jointly developed this form for ECO declaration with the purpose to answer the most frequently asked customer questions. This version of the ECO declaration is adjusted to the document "Product-related Environmental Attributes", issued by the European Association for Standardizing Information and Communication Systems (ECMAs), TR/70.

The ECO declaration lists both legal (§) and non-legal requirements. The legal requirements can be found in Danish, Norwegian and Swedish laws and ordinances. Non-legal requirements are based on international and/or industry standards, de facto standards or market requirements.

Measurements have been made with new product and are representative for the model. During measurements supplies recommended by the manufacturer have been used where applicable.

This ECO declaration, including the comments, will be regularly adjusted to the product development, new regulations as well as the growing base of environmental knowledge including comments from authorities, customers, users and other interested parties.

This ECO declaration exist in three versions, Danish, Norwegian and Swedish. In all versions, pages 1-3, except language, are identical. The last page with comments varies per country, since the references are given to each country legislation and ordinances.

The use of this ECO declaration is only allowed in its complete form and all questions 1.1-10.2 shall be answered in order to be eligible. For criteria with more than one possible answer, at least one has to be declared.

This ECO declaration may only be used by a supplier after having signed a contract with the corresponding IT-organisations specified above.

Further information can be found via the Internet at: <http://www.sito.se/>.

This version of the ECO declaration is to be used for products announced after June 1998.

Re-quire-ment		Legal re-quire-ment	Requirement met			See com-ments on last page
			Yes	No	Not rel	
<b>1</b>	<b>Environmental policy &amp; Environmental management</b>					
1.1	The manufacturer has a documented environmental policy approved by the management.		X			•
1.2	The manufacturer has an environmental management system according to: ISO 14001		X			•
1.3	The manufacturer regularly publishes an environmental report.		X			•
1.4	The manufacturer and the manufacturer's representative markets its products in accordance with environmental rules in applicable marketing legislation.	§	X			•
<b>2</b>	<b>Environmental conscious design</b>					
2.1	The product is designed for easy dismantling during recycling. Gluing/ welding of different materials has been avoided.		X			
2.2	Large mechanical plastic parts consist of one material or of materials that are easy to separate.		X			
2.3	All mechanical plastic parts, heavier than 25 g have material codes according to ISO 11469		X			•
2.4	CFCs and HCFCs are not present in the product.	§	X			•
2.5	Asbestos, PCB and PCT are not present in the product.	§	X			
2.6	Mercury is not present in the product.		X			•
2.7	Brominated flame retardants, PBB and PBDEs are not present in mechanical plastic parts heavier than 25g		X			•
2.8	Cadmium is not present in mechanical plastic parts heavier than 25g		X			•
2.9	Lead is not present in mechanical plastic parts heavier than 25g		X			•
2.10	Chloroparaffins with chain length 10-13 C atoms, chlorinated greater than 50% are not present in mechanical plastic parts heavier than 25g		X			•
2.11	Cadmium is not present in the CRT (Cathode Ray Tube).				X	•
2.12	The product is modular and no special tools are needed to upgrade the product.		X			
2.13	Processor, memory and cards of various types can be changed/upgraded.		X			
2.14	Hard disk and/or floppy drive can be changed/upgraded.		X			
<b>3</b>	<b>Batteries</b>					
3.1	Batteries, defined as hazardous in the EU Directive 91/157/EEC are not used in the product.		X			•
3.2	If batteries, defined as hazardous are used in the product these are labelled according to the EU Directive 93/86/EEC.	§			X	
<b>4</b>	<b>Energy consumption</b>					
4.1	Operation: 140 W* stand by: Not relevant W Sleep mode: Not relevant W off: Not relevant W			≤ Value		
4.2	Information about the energy save function is given in the user manual.				X	
4.3	The product meets the requirements of Energy Star ____ or NUTEK ____.			X		•
<b>5</b>	<b>Noise characteristics</b>					
5.1	Sound power level: operating: L <sub>WA</sub> 6.0B L <sub>WAL</sub> ____ B L <sub>WAd</sub> 6.3B idling/standby: L <sub>WA</sub> 6.0B L <sub>WAL</sub> ____ B L <sub>WAd</sub> 6.3B			X* ≤ Value ≤ Value		•
5.2	Sound pressure level, LpAm: operation, meas dist: 0,5m: ____dB, 1,0m: 43.0dB, 0,25m: ____dB idle/standby, measurement distance 0,5m: ____dB, 1,0m: 43.0dB, 0,25m: ____dB			X* ≤ Value ≤ Value		•

Re-quire-ment		Legal re-quire-ment	Requirement met			See com-ments on last page
			Yes	No	Not rel	
<b>6</b>	<b>Emissions</b>					
6.1	Display/portable computer meets the requirements regarding electromagnetic fields according to: MPR-II, TCO-91 or prEN 50279, category A, B, or C.				X*	•
<b>7</b>	<b>Electrical safety, EMC and connection to the telephone network</b>					
7.1	The product meets applicable electrical safety standards.	§	X			•
7.2	The product meets applicable EMC (electromagnetic compatibility) standards.	§	X			•
7.3	The product is to be connected to the PTT network and meets the EU telecommunications Directive.	§			X	•
7.4	The product is CE-marked.	§	X			•
<b>8</b>	<b>Ergonomics</b>					
8.1	The personal computer system meets the ergonomic requirements of EN 29241-3.				X*	•
8.2	The product keyboard meets the requirements of ISO 9995 and EN ISO 9241-4.				X*	
<b>9</b>	<b>Packaging and documentation</b>					
9.1	The product package material does not contain Cadmium.		X			•
9.2	The product package material does not contain CFC/HCFC.		X			•
9.3	Product packaging (max, per frame): Material type: Corrugated Cardboard Carton weight: 7 kg Material type: Polyethylene cushions weight: 7 kg Material type: Plastic Bag weight: <1 kg				≤ Value ≤ Value	
9.4	The company participates in/ has its own system for collection and recycling of packaging material.	§	X			•
9.5	Plastic packaging material is marked according to DIN 6120 or ISO 11469.			X		
9.6	User and product documentation is printed on non chlorine bleached paper. Post consumer recycled content _____%		X*		≤ Value	
<b>10</b>	<b>Recycling</b>					
10.1	The company has a system for reuse/ recycling of the product.		X			•
10.2	Information about the system according to 10.1 can be found in the user manual or specified in 11 below.		X*			
<b>11</b>	<b>Additional information</b>					
4.1	140 W is the power consumption for the maximum configuration. The system is rated for up to 270 Watts. The system also has a redundant power supply in case of single supply failure.					
5.1/ 5.2	Energy average of the four 1.0 meter bystander positions. Declaration sheet according to ISO 9296 is available.					
6.1	This product is a S/390-based workstation or server .					
8.1/ 8.2	This product is a S/390-based workstation or server.					
9.6	In the United States, S/390 Technical Manuals produced by the IBM Software Fulfillment Center are printed with soy-based ink on recycled paper containing 20% post-consumer waste fiber. This paper is manufactured using the Elemental Chlorine-Free Process. In Europe, S/390 Manuals produced by IBM Software Manufacturing Solutions are printed on paper manufactured using the Totally Chlorine-Free Process. This paper is manufactured by mills certified to ISO 14001.					
10.2	The customer may contact their IBM representative for information on the IBM Product End of Life Program in their respective country.					

## General

This ECO declaration meets the view which has been brought to the industry by the Ecocycle Commission of the Swedish government and the Swedish Environmental Protection Agency.

### 1 Environmental policy and management system

- 1.1-1.3 The manufacturer's representative, supplier or importer can also provide this information if needed.
- 1.4 The requirements are based on the Swedish marketing law SFS 1995:450.

### 2 Environmental conscious design

- 2.4-2.11 Refers to substance levels which do not exceed natural background levels.
- 2.4 Required according to SFS 1995:636 and EU-Directive 3093/94/EEC group I, II and VIII.
- 2.6 According to SFS 1996:319 mercury is prohibited in relays, level indicators, pressure switches, temperature regulators/thermostats, electrical switches and contacts for continuous current transmission.
- Mercury can occur in small amounts in fluorescent tubes and shall after use be treated as hazardous waste.
- 2.7 Within OECD work is going on to limit the use of certain brominated flame retardants (PBB/PBDE).
- These flame retardants are:
- decabrombiphenyl CAS no 13654-09-6
  - pentabromdiphenyleter CAS no 32534-81-9
  - octabromdiphenyleter CAS no 32536-52-0
  - decabromdiphenyleter CAS no 1136-19-5
- 2.8 The requirement can be found in the Swedish ordinances SFS 1985:839 and SNFS 1992:15.
- 2.3-2.10 Examples of mechanical plastic parts are product covers/housings and similar construction details.

### 3 Batteries

- 3.1 According to the EU-Directive and corresponding Swedish ordinances batteries which contains lead, cadmium and mercury with specified rates are classified as hazardous. In Sweden there are requirements regarding import registration of hazardous batteries.

### 4 Energy consumption

- 4.3 Swedish recommendations for energy efficient products follow the voluntary US EPA system, called "ENERGY STAR". From 1998-01-01 the NUTEK requirement for displays has been incorporated into the new EPA MOU v3.0. For more information, see the EPA Internet home-page: [www.epa.gov/office.html](http://www.epa.gov/office.html).

### 5 Noise characteristics

- Sound measurements are performed according to ISO 7779 and ISO 9295, the results are declared according to ISO 9296 or ECMA-109.
- 5.1 LWAd = declared A-weighted sound power level rel 1pW for at least 3 samples. LWAI = incl. impulsive noise for one sample. LWA = measured on one product sample. Sound power to be reported in bel (B) according to ECMA 109 and decibel according to ISO 7779. 1B = 10 dB. Observe! This formula can NOT be used to calculate sound power level to sound pressure level. In Sweden, Statskontoret Technical Norm 26:3 lists recommendations regarding maximum sound power levels in bels for IT products and office machines.
- 5.2 LpAm = declared average A-weighted sound pressure level rel 20uPa. Observe! To be able to compare the noise levels from two products, sound power is used. If sound pressure is used, the measurements must be performed according to the same standard, at the same distance and during the same operational conditions.

### 6 Emissions

- 6.1 Extensive research has not been able to demonstrate any negative health effects caused by electromagnetic fields from visual displays. EU Directive as well as Swedish regulation exist, but legally binding threshold limit values do not exist. Since 1986, the market in Northern Europe has demanded visual displays with reduced electromagnetic fields. According to prEN50279 (which is based on the Swedish standard SS4361490), electromagnetic fields are specified in three categories:

prEN50279 category:	A	B	C
Approximately equivalent to the levels according to	TCO-91	MPR-II	--

Category C has no recommended levels for electrostatic and electrical fields, band I. This category is intended for electrical products, insulation class II without protective earth. The standard has a higher level of requirements on the test laboratory. Additionally it contains a section on measuring electromagnetic fields in the office environment and the inaccuracy of such measurements. Observe that that the criteria can normally only be met if the product is connected to a grounded wall outlet. During 1998 prEN50279 is expected to be adopted as a European norm.

### 7 Electrical safety, EMC and connection to the telecommunications network

- 7.1-7.3 The product shall meet the applicable EU-Directives: 73/23/EEC, 93/68/EEC for electrical safety, 89/336/EEC for EMC (electromagnetic compatibility) and if connected to the telecommunications network, also the EU Teleterminal Directive 91/26/EEC.
- 7.4 The CE-mark is the manufacturer's confirmation to National authorities that the product meets applicable EU-Directives. On requested by the authority, the manufacturer or must be able to present an EC Declaration of Conformity.

### 8 Ergonomics

- 8.1 The Swedish standard SS-EN 29241-3 specifies visual ergonomic requirements for computer systems, including system unit, display and operating system software.

### 9 Packaging and documentation

- 9.1-9.2 National ordinances/standards for environmentally conscious packaging do not exist.
- 9.4 The requirements can be found in SFS 1994:1235. The company must see to that used packaging is collected and recycled, either by having an own system or be part of an industry system like IT Återvinning or a general system, such as the REPA-registret.

### 10 Recycling

- 10.1 Work on Swedish regulation on producer responsibility for electric and electronic products is in progress. The Swedish IT Companies organisation already in 1996 established a voluntary system, IT Återvinning, which several companies have joined. Other companies have their own systems or contracts with recycling companies.

**Product** Laser Copy

**Company** M-real

**Site** Husum

Information gathered from 00-01-01 to 00-12-31

Environmental product declaration for paper

**Environmental Management**

**Certified environmental management system** (at the mill since) **ISO14001(1997)**

**Environmental aspects of wood procurement**

Main supplier is certified (ISO 14001, Chain of custody-FSC). Certification of the other supplier is planned during 2002. Share of wood from FSC-certified woods is 17 %.

**Environmental parameters**

The figures are based on methods and procedures of measurement approved by the local (or national) environmental regulators at the production site. The figures include both paper and pulp production.

<b>Water</b>	<b>COD</b>	<b>24,5</b>	kg/t
	<b>AOX</b>	<b>0,162</b>	kg/t
	<b>N<sub>Tot</sub></b>	<b>0,089</b>	kg/t
	<b>P<sub>Tot</sub></b>	<b>0,035</b>	kg/t

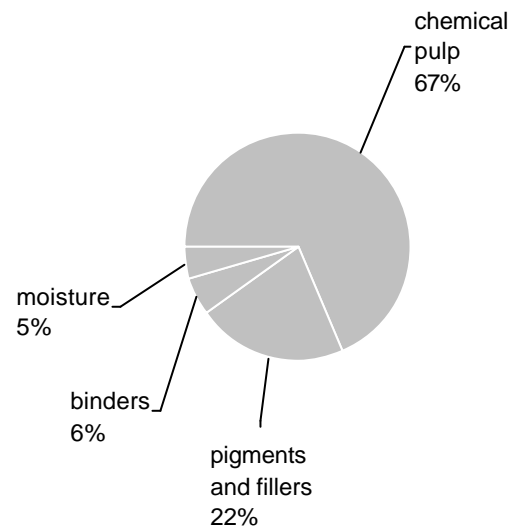
<b>Air</b>	<b>SO<sub>2</sub></b>	<b>1,01</b>	kg/t
	<b>NO<sub>x</sub></b>	<b>1,30</b>	kg/t
	<b>CO<sub>2</sub> (fossil)</b>	<b>175</b>	kg/t

**Solid waste landfilled** **46** BDkg/t

**Purchased electricity consumption**

/ tonne of final product **920** kWh

**Product composition**



**More information**

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## ENVIRONMENTAL PRODUCT DECLARATION (EPD) MATER – BI<sup>®</sup> NF TYPE: BIODEGRADABLE PLASTIC PELLETS FOR FILMS

### 1. PRESENTATION OF THE ORGANISATION AND OF THE PRODUCT

#### The company

Novamont S.p.A. is an Italian company that was created in 1989 as a research centre with the task of developing new products and new technologies using renewable raw materials of vegetable origin. The company produces and markets MATER - BI<sup>®</sup>, a family of thermoplastic materials derived from renewable resources, covering a variety of applications in the fields of waste collection, hygiene, agriculture, catering, and packaging.



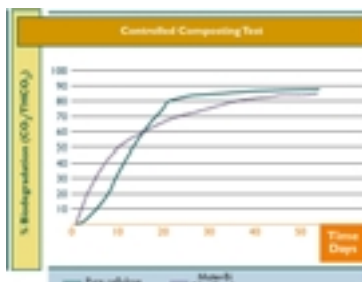
Novamont's products and technologies are protected by more than 50 patent families covering the most industrialised countries.

Novamont produces Mater - Bi<sup>®</sup> in its factory in Terni, Italy, with a production capacity of 20,000 ton/year. As a result of its commitment to the environment, the factory is working to obtain in 2002 ISO 14000 and EMAS certification. Further information on Novamont and its Mater-Bi<sup>®</sup> products can be found on the website [www.materbi.com](http://www.materbi.com).



#### The NF-type MATER – BI<sup>®</sup> pellets

This is a biodegradable thermoplastic material made of natural components (corn starch and vegetable oil derivatives) and of biodegradable synthetic polyesters. The material is certified as biodegradable and compostable in accordance with European norm EN 13432 and with the national regulations UNI 10785 and DIN 54900.



*CONTROLLED COMPOSTING TEST (Biodegradation of the NF-type Mater – Bi<sup>®</sup> material, obtained using the prEN 14046 test method (equivalent to the ISO 14855 norm) for measurement of the aerobic biodegradability in a composting environment).*

MATER - BI<sup>®</sup> NF is certified for food contact, in accordance with regulation EN 92-128; it does not contain any dangerous substances, as defined by the Community Directive 67/548/CEE, as modified by the Commission directive 97/69/CE and subsequent modifications.

NF-type MATER - BI<sup>®</sup> is made by Novamont S.p.A. in its Terni factory, and is mainly used as a raw material for the production of films.

Table 1.1 shows the main technical and functional characteristics of the material extruded into films. By way of example, the data for NF779 and NF803/1 grades are given.

#### AVERAGE PHYSICO-MECHANICAL PROPERTIES

CHARACTERISTICS	UNIT OF MEASUREMENT	TEST	VALUES	NOTES
Melting temperature	°C	DSC	110	Granules
Melt index (Melt Flow Rate)	g/10 min.	ASTM D1238	3	at T=150°C, weight=5kg
Density	G/cm <sup>3</sup>	Picnometer	1.29	granules, at 23°C
Breaking load	Mpa	ASTM D882	22	film thickness 30µm
Ultimate elongation	%	ASTM D882	340	film thickness 30µm
Young's modulus	MPa	ASTM D882	210	film thickness 30µm
Tear Resistance	N/mm	ASTM-1938	36	i MD
	>>	>>	36	p MD
	>>	>>	46	i TD
	>>	>>	46	p TD
Haze	%	ASTM-D1003	95	
Water vapour permeability	gx30µm/m_x24h	ASTM E398	850	film 30µm, 38°/90%RH

Table 1.1 – Physico-mechanical properties of Mater – Bi<sup>®</sup> NF film

## 2. ENVIRONMENTAL PERFORMANCE DECLARATION

The environmental performance refers to the NF779 and NF803/1 grades; however, it has been verified that the results can also be applied to other grades of Mater - Bi<sup>®</sup> for films with the initials NF.

### Methodology

The method used to quantify the environmental performance of MATER - BI<sup>®</sup> NF pellets is the Life Cycle Assessment (LCA), which is regulated by the international 14040 series ISO norms.

In the study carried out, the indications of the above-mentioned ISO and the PSR I – 2001:3 (Specific Reference Product Requisites for thermoplastic materials) norms were respected.

### Functional unit

The functional unit of the study is 1 kg of pellets.

### System boundaries – analysed phases

The phases included in the LCA study of the pellets are (see Figure 2.1):

- Production of the pellets “from cradle to gate”, which is divided into:
  - Production of the raw materials
  - Transportation of these raw materials from the suppliers to the Terni factory
  - Production of the pellets in the Terni factory, and subsequent packaging of the pellets
- Transformation of the pellets by means of extrusion
- Disposal of the pellets by three different methods:
  1. Composting
  2. Incineration
  3. Landfilling

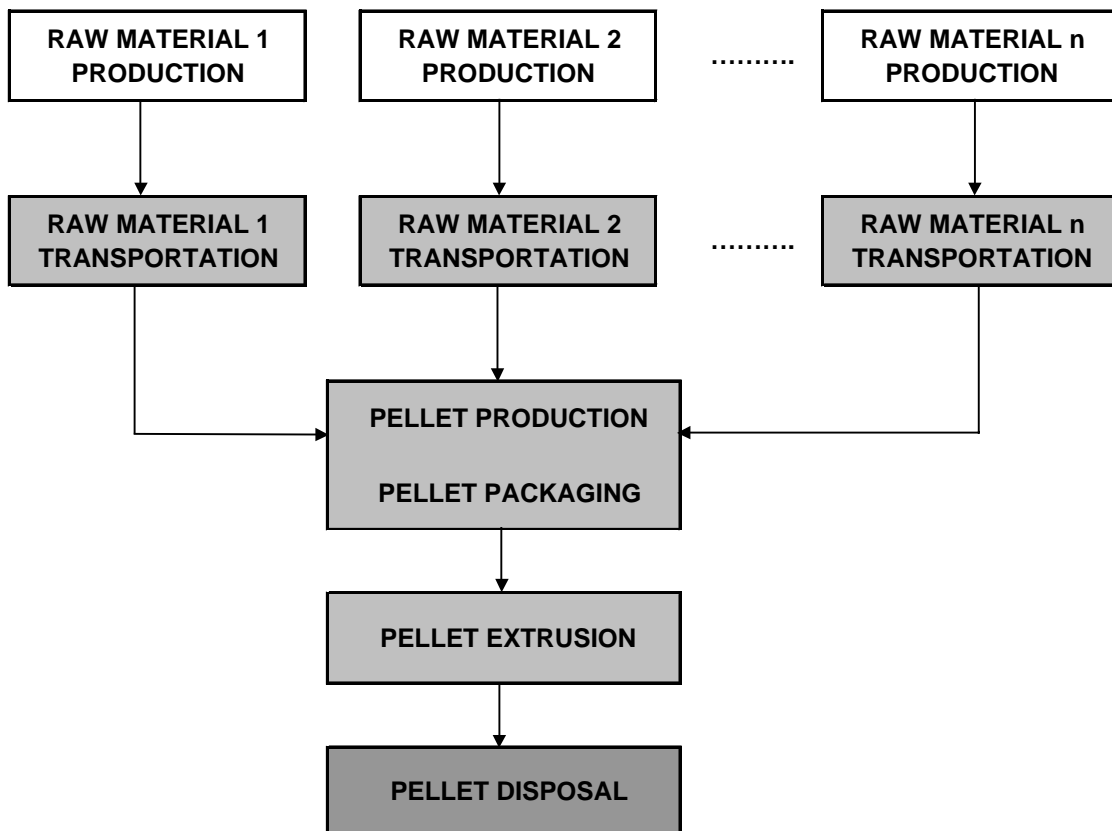


Figure 2.1 – Phases analysed in the life cycle of the pellets

### Main hypotheses and assumptions

- **Electricity:** for all processes that take place in Italy, the mix of the Italian electrical power stations (data of Banca Dati Italiana i – LCA of ANPA) was used to assess the impacts resulting from the production and distribution of electrical energy; Novamont currently uses energy produced by the new Edison station in Terni;
- **Incineration:** inclined grid combustion, with a combustion temperature of 1100°C, and electrical energy production with a gross electrical efficiency<sup>1</sup> of 8%;
- **Landfilling:** the biodegradability of Mater – Bi<sup>®</sup> NF is 30% (tests carried out in an aqueous environment under anaerobic conditions), 50% treatment of the percolate, and recovery of the biogas with 20% efficiency; the gas collected is burnt, 60% in gas engines, and the remaining 40% in a low NO<sub>x</sub>-emission torch;
- **Composting:** closed system with collection and treatment of the process air, forced ventilation and recycling of the percolate; the biodegradability of Mater – Bi<sup>®</sup> NF is 60% by weight (30-day thermophilic phase, at an average temperature of 50°C);
- **Environmental “credits”:** the electrical energy produced by incineration and combustion of the biogas in landfill is taken into account by assessing the environmental impact avoided by the replacement of the same electricity in Italy. For composting, a credit is given to the compost produced, assuming that it is used for nursery gardening and therefore replaces volumes of peat in the preparation of cultivation substrates. A credit is also given for CO<sub>2</sub> of biological origin due to the growth of agricultural species that constitute part of the raw materials of the pellets, calculated on the basis of the quantity of biological carbon contained in 1 kg of pellets. This credit is returned to the environment during the disposal phase of the pellets, to an extent that varies according to the supposed disposal scenario.

### Results

The results of the environmental performance for 1 kg of pellets, are quantified using the values of the associated indicators of environmental impact, listed by ANPA in the “Rules for writing the Environmental Product Declaration”, Attachment C.

The results are presented in three parts:

1. “From cradle to gate” (Tables 2.1 and 2.2), which is in turn divided into:
  - Production of the components
  - Transportation of the components
  - Production + packaging of the pellets
2. Transformation of the pellets (Tables 2.3 and 2.4)
3. Disposal of the pellets (Tables 2.5 and 2.6)

<sup>1</sup> “Gross” efficiency because it does not take account of its own electrical energy consumption, linked to the running of the incinerator.

**FROM THE RAW MATERIALS TO THE PELLETS (“FROM CRADLE TO GATE”)**

<b>Indicator</b>	<b>Unit of measurement</b>	<b>COMPONENT PRODUCTION</b>	<b>COMPONENT TRANSPORTATION</b>	<b>PROD.+PACK. OF PELLETS</b>
Renewable primary energy consumption	MJ	0.258	0	1.1
Non-renewable primary energy consumption	MJ	48.5	0.615	4.32
Climatic change (greenhouse effect) from non-renewable carbon	kg CO <sub>2</sub> eq	1.54	0.0438	0.325
Climatic change (biological greenhouse effect) from renewable carbon	kg CO <sub>2, biol</sub> eq	-0.631	0	0
Destruction of the stratospheric ozone layer	kg CFC-11 eq	0.000000358	0.0000000424	0.00000000862
Acidification	kg SO <sub>2</sub> eq	0.0116	0.000223	0.00249
Euthophication	kg PO <sub>4</sub> - eq	0.00681	0.0000293	0.000158
Formation of photochemical oxidisers	kg ethylene eq	0.00281	0.0000135	0.000163
Production of dangerous wastes	kg	0.00117	0	0.0601
Production of non-dangerous wastes	kg	0.189	0	0.046

*Table 2.1 – Values of the associated indicators of environmental impact for 1 kg of pellets from cradle to gate*

<b>Resource</b>	<b>Unit of measurement</b>	<b>COMPONENT PRODUCTION</b>	<b>COMPONENT TRANSPORTATION</b>	<b>PROD.+PACK. OF PELLETS</b>
Water	kg	19.973	0.103	14.86
Clay	kg	0.0000666	0	0.00568
Baryta	kg	0.00283	0	0.000239
Bauxite	kg	0.0000875	0	0.0000204
Limestone	kg	0.0851	0.0000247	0.00128
Carbon	kg	0.0558	0	0.0292
Coke	kg	0.0703	0.000247	0.00222
Natural gas	m <sup>3</sup>	0.734	0.0009	0.0238
Gravel	kg	0.000817	0	0.00354
Wood	kg	0.00107	0	0.0273
Petroleum	kg	0.42943	0.013	0.05296
Sulphur	kg	0.00819	0	0

*Table 2.2 – Main consumption of resources for 1 kg of pellets, from cradle to gate*

## PROCESSING THE PELLETS

The processing phase considers the extrusion of pellets to produce film that can be used for packaging, bags, agricultural mulching and so on. The electrical energy consumed is equal to 0.46 kWh per kg of pellets. The related environmental impact is shown in Tables 2.3 and 2.4. The values shown refer to the functional unit, that is, to 1 kg of pellets. The output is equal to 0.98 kg, as the mass yield of the process is approximately 98%.



Indicator	Unit of measurement	PELLET PROCESSING
Consumption of renewable primary energy	MJ	0.5292
Consumption of non-renewable primary energy	MJ	4.1944
Climatic change (greenhouse effect)	kg CO <sub>2</sub> eq	0.32536
Climatic change (biological greenhouse effect)	kg CO <sub>2, biol</sub> eq	0
Destruction of the stratospheric ozone layer	kg CFC-11 eq	0
Acidification	kg SO <sub>2</sub> eq	0.002499
Eutrophication	kg PO <sub>4</sub> eq	0.0000958
Formation of photochemical oxidisers	kg ethylene eq	0.000131
Production of dangerous wastes	kg	0.00000331
Production of non-dangerous wastes	kg	0.024794

Table 2.3 – Values of the associated indicators of environmental impact for the processing of 1 kg of pellets

<b>Resource</b>	<b>Unit of measurement</b>	<b>PELLET PROCESSING</b>
Water	kg	15.974
Clay	kg	0.00014406
Baryta	kg	0.00025872
Bauxite	kg	0.00002156
Limestone	kg	0.00092414
Carbon	kg	0.031556
Coke	kg	0.000000069
Natural gas	m <sup>3</sup>	0.01988
Gravel	kg	0.0038318
Wood	kg	0.00020678
Petroleum	kg	0.05341

*Table 2.4 – Main consumption of resources for the processing of 1 kg of pellets*

## DISPOSAL OF THE PELLETS

Indicator	Unit of measurement	COMPOSTING	INCINERATION	LANDFILL
Consumption of renewable primary energy	MJ	0.0451	-0.387	-0.0858
Consumption of non-renewable primary energy	MJ	-4.15	-1.41	-0.486
Climatic change (greenhouse effect) from non-renewable carbon	kg CO <sub>2</sub> eq	0.818	1.14	1.69
Climatic change (biological greenhouse effect) from renewable carbon	kg CO <sub>2, biol</sub> eq	0.631	0.631	0.702
Destruction of the stratospheric ozone layer	kg CFC-11 eq	-0.00000000435	0.0000000311	0.00000000702
Acidification	kg SO <sub>2</sub> eq	0.00012	-0.000202	-0.00000717
Eutrophication	kg PO <sub>4</sub> -eq	0.0000169	0.000208	0.000453
Formation of photochemical oxidisers	Kg ethylene eq	0.0000785	0.000117	0.000722
Production of dangerous wastes	kg	-0.000101	0.0000131	-0.0000000671
Production of non-dangerous wastes	kg	-0.0298	0.00478	0.697

Table 2.5 – Values of the associated indicators of environmental impact for the disposal of 1 kg of pellets, in different technological scenarios

Resources	Unit of measurement	COMPOSTING	INCINERATION	LANDFILL
Water	kg	1.352	-7.05	-2.588
Clay	kg	0.0000173	0.000156	-0.0000184
Baryta	kg	0.0000229	-0.000185	-0.0000411
Bauxite	kg	0.0000115	0.000421	0.0000064
Limestone	kg	0.00134	0.00672	0.00112
Carbon	kg	0.00268	-0.0232	-0.00513
Coke	kg	-0.16	0.0225	0.000316
Iron	kg	0.00076	0.034902	0.0005743
Natural gas	m <sup>3</sup>	0.001247	0.006821	-0.00223
Gravel	kg	0.0132	0.00726	0.0123
Wood	kg	-0.0000186	-0.000091	-0.0000328
Petroleum	kg	0.00429	-0.02842	-0.00521

*Table 2.6 – Main consumption of resources for the disposal of 1 kg of pellets in different technological scenarios*

The negative values of some of the parameters in tables 2.5 and 2.6 are due to the environmental credits mentioned above. For composting, these credits are due to the replacing of the peat with the compost produced; for incineration and landfilling, the credits are linked to the replacement of the electricity. Consequently, they greatly depend on the hypothesised electrical mix, in this case, the Italian mix, of which more than 80% is based on fossil fuels. The associated emissions therefore are significant, and the environmental benefits of replacing this electricity are considerable.

***In accordance with Italian law and European directives, Novamont recommends the post.-consumer disposal of products in Mater-Bi<sup>®</sup> NF, such as sacks, packaging, etc., by means of separated collection with organic waste, and composting treatment. Like for other organic waste, landfilling of products in Mater-Bi<sup>®</sup> should be avoided.***

### **3. INFORMATION ON THE CERTIFICATION**

This Environmental Product Declaration (EPD) was validated by the “Agenzia Nazionale per la Protezione dell’Ambiente” (the Italian Agency for Environmental Protection , ANPA) in December 2001.

The registration number of this declaration is EPD I-ANPA-4.

This document and the reference regulations can be downloaded from the website of ANPA (<http://www.sinanet.anpa.it/ecolprod>) or from the website of Novamont S.p.A. (<http://www.materbi.com>).

### **4. REFERENCES**

- *Valutazione del Ciclo di Vita di granulato plastico in Mater – Bi<sup>®</sup> (tipologia NF) – Rapporto Finale*
- *Regole per la redazione della Dichiarazione Ambientale di Prodotto – ANPA (Agenzia Nazionale per la Protezione dell’Ambiente), Ed. luglio 2001*
- *Materiali termoplastici in forma di granulo, polvere o equivalente - PSR I – 2001 - 3*

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## Summary of Vattenfall AB's Certified Environmental Product Declaration of Electricity from the river Ume älv S-P-00028, 2002-03-01.

### MANUFACTURER

Vattenfall AB Vattenkraft is responsible for the generation of electricity on the river Ume älv. Vattenfall AB Vattenkraft is a part of Vattenfall AB, SE-162 87 Stockholm, Sweden. Phone: +46-8-739 50 00; fax: +46-8-37 77 95; <http://www.vattenfall.se>. Vattenfall AB Vattenkraft has been certified in accordance with ISO-14001 since 1999, and certain installations are registered in the EMAS system.

### THE PRODUCT AND FUNCTIONAL UNIT

Vattenfall AB Vattenkraft owns 10 hydropower plants on the river Ume älv. These plants have a total installed capacity of 1185 MW and generate 4.86 TWh in an average year. The 5 reservoirs on the river allow the generation to follow the load curve, and electricity can be delivered without backup sources. The functional unit is 1 kWh of electricity delivered to the main grid during the reference year, 2000.

### ENVIRONMENTAL PERFORMANCE

The EPD<sup>®</sup> system, managed by the Swedish Environmental Management Council, is based on ISO TR 14025, Type III environmental product declarations. The relevant governing documents in hierarchical order are: PSR 1998:1, rev 1, MSR 1999:2, ISO 14025, ISO 14040-43, and ISO 13600.

### SYSTEM BOUNDARIES

The EPD<sup>®</sup> contains two phases, *generation* and *use* (PSR). The use phase is mainly qualitative and comprises transmission and distribution of 1 kWh electricity. The assumed lifetimes are 60 year for the machines and 100 years for the dams.

The power plants at Stornorrfors, Juktan and Umluspen, with their respective storage reservoirs, have been inventoried with respect to construction and operation. Dismantling has not been included since the pace of reinvestment is such that the entire plant is renewed during its assumed lifetime. The chosen plants generate 56% of Vattenfall's total generation on the river, and Vattenfall generates 63% of the total generation on the river. The plants are representative for the entire river as their climate, geography, technology and construction year all vary. Different functions are also covered since a long-term and a short-term storage reservoir are included. The environmental impacts from the three power plants have been weighted together in accordance with their electricity generation, with the exception of inundation-related impacts where the reference has been the total generation on the entire river. The complete certified declaration also includes descriptions of risks, biodiversity impacts and land use, in accordance with PSR.

## The generation phase

A very short summary of inventoried data is presented below.

Category Resource use	Unit/kWh	Input
Non-renewable materials:		
Copper in ore	g	0.00862
Gravel and sand	g	3.40
Iron in ore	g	0.160
Limestone	g	0.442
Rock	g	53.5
Soil	g	30.7
Renewable materials:		
Wood, moist	g	0.0506
Non-renewable energywares:		
Coal,oil, natural gas	kWh	0.00223
Uranium in ore	g	4.40*10 <sup>-6</sup>
Renewable energywares:		
Bio fuels	g	0.0094
Hydropower	kWh	0.000152
Use of recycled materials:		
Metal scrap	g	0.0515
Water use*	g	2.29
Materials from the technosphere (aggregation of app. 50 substances)	g	0.00842

\*This does not include the water passing through the turbines.

## Emissions

Total emissions, emissions caused by inundation and weighted totals for the entire river are presented below.

Emission	Unit/kWh	Total Umluspen	Total Stornorrhors	Total Juktan	Inun- dation	Total for the river Ume älv
		Relative share of the total weighted valaue for the whole river.				Weighted figure
		<b>14.3%</b>	<b>82.5%</b>	<b>3.2%</b>		
GHGs	g GWP eq. (100 year)	1.60	0.602	5.30	3.10	4.00
Ozone-depleting gases	g CFC-11 eq. (20 year)	15.7*10 <sup>-9</sup>	6.19*10 <sup>-9</sup>	75.2*10 <sup>-9</sup>		9.78*10 <sup>-9</sup>
Acidifying substances	mole H <sup>+</sup>	2.66*10 <sup>-4</sup>	1.01*10 <sup>-4</sup>	10.1*10 <sup>-4</sup>		1.54*10 <sup>-4</sup>
Gases contributing to the formation of ground-level ozone	g ethene- eq.	3.67*10 <sup>-4</sup>	1.55*10 <sup>-4</sup>	12.9*10 <sup>-4</sup>		2.22*10 <sup>-4</sup>
O <sub>2</sub> -consuming/eutrophyng substances	g O <sub>2</sub>	0.0494	0.0186	0.183	2.07	2.10
Toxic substances:						
Antimony (Sb)	g	5.71*10 <sup>-10</sup>	2.23*10 <sup>-10</sup>	7.13*10 <sup>-10</sup>		4.96*10 <sup>-10</sup>
Arsenic	g	1.34*10 <sup>-7</sup>	0.810*10 <sup>-7</sup>	18.6*10 <sup>-7</sup>		1.46*10 <sup>-7</sup>
Dioxin	g	1.14*10 <sup>-14</sup>	0.803*10 <sup>-14</sup>	21.4*10 <sup>-14</sup>		1.52*10 <sup>-14</sup>
Oil to water	g	16.4*10 <sup>-5</sup>	1.53*10 <sup>-5</sup>	117*10 <sup>-5</sup>		7.39*10 <sup>-5</sup>
PAH	g	7.61*10 <sup>-8</sup>	3.09*10 <sup>-8</sup>	24.4*10 <sup>-8</sup>		4.43*10 <sup>-8</sup>
Deposition of phosphorus in river sediment	g				1.55*10 <sup>-3</sup>	1.55*10 <sup>-3</sup>

Other information	Unit/kWh	Input	Output
Toxic waste, fuel-related: Highly radioactive waste products	g		1.49*10 <sup>-6</sup>
Toxic waste, non fuel-related	g		0.052
Material to recycling: Crushed concrete	g		0.000109
Metal scrap	g		0.0677
Land use:	m <sup>2</sup>	0.00108	
Out of which inundated area	m <sup>2</sup>	0.000306	

## Noise

The most notable noise outdoors is the sound from water running through above-earth power plants. The noise levels are, however, lower than before development.

## Conclusions

The major share of the environmentally relevant emissions are connected to the construction of, and re-investment in, plants and dams. Emissions of GHGs and eutrophying substances are, however, mainly caused by the inundation. The green-house effect is minor, by international comparison, since no methane is generated at these latitudes.

## The use phase

The use phase (PSR) for the product consists of transmission and distribution of electricity, plus the extra production caused by transmission losses in the grid. The life cycle of the grid consists of construction, operation and dismantling. The transmission corridors have a demonstrated positive impact on biodiversity.

## LAND USE AND IMPACT ON BIODIVERSITY

Vattenfall's Biotope Method<sup>®</sup> analyses the impact on biodiversity as a direct consequence of the utilisation of land and water for economic activities. Affected areas are categorised into Critical biotope, Rare biotope, General biotope and Biotope loss.

The three studied power plants, with their respective storage reservoirs, together occupy and area of 29 500 hectares. The main part of this, 27 100 hectares, are reservoirs. A total of 8 360 hectares have been inundated in connection with dam construction and reservoir establishment. The table below shows the changes to biotope categories caused by the construction of the three plants.

Biotope Category	Before		After		Difference	
	ha	m <sup>2</sup> /kWh	ha	m <sup>2</sup> /kWh	ha	m <sup>2</sup> /kWh
Biotope loss	0.0	0.0	9 161	3.3*10 <sup>-4</sup>	+9 161	+3.3*10 <sup>-4</sup>
Critical biotopes	8 658	3.2*10 <sup>-4</sup>	331	1.2*10 <sup>-5</sup>	-8 327	-3.1*10 <sup>-4</sup>
Rare biotopes	8 411	3.1*10 <sup>-4</sup>	26	9.5*10 <sup>-7</sup>	-8 385	-3.1*10 <sup>-4</sup>
General biotopes	12 442	4.6*10 <sup>-4</sup>	19 993	7.4*10 <sup>-4</sup>	+7 550	+2.8*10 <sup>-4</sup>

*Compilation of biotope changes for the three power plants on the river Ume älv.*

## **RISK INVENTORY AND OTHER INFORMATION**

See chapter 5 in the complete EPD® documentation, reference 1.

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### **INFORMATION**

This is a very short summary of the material that has been certified. The complete documentation is presented with a step-wise and user-friendly methodology.

### **REFERENCES TO THE COMPLETE DOCUMENTATION**

1. Vattenfall AB Generation's Certified Environmental Product Declaration for electricity from the river Ume älv.
2. Ume och Lule älv, teknik och miljö. Bilaga till *Vattenfall AB Elproduktions Certifierade Miljövarudeklaration för el från Ume älv* som kan beställas från Vattenfall. Only in Swedish.

### **VALIDITY**

EPD® S-P-00028, which has been certified in accordance with the rules for the EPD® system, is valid until the 1<sup>st</sup> of March, 2005.

### **ACCREDITED CERTIFYING BODY**

SP Sveriges Provnings och Forskningsinstitut, P.O. Box 857, SE-501 15 Borås, Sweden.