Momentus XT SSHD Product Life Cycle Analysis Summary

Product Description

The Momentus XT SSHD is an all-in-one design providing HDD capacity at SSD speeds. This product is best suited for laptops and mobile work stations, small form factor and all in one PCs, and high performance laptop gaming systems.

Life Cycle Analysis

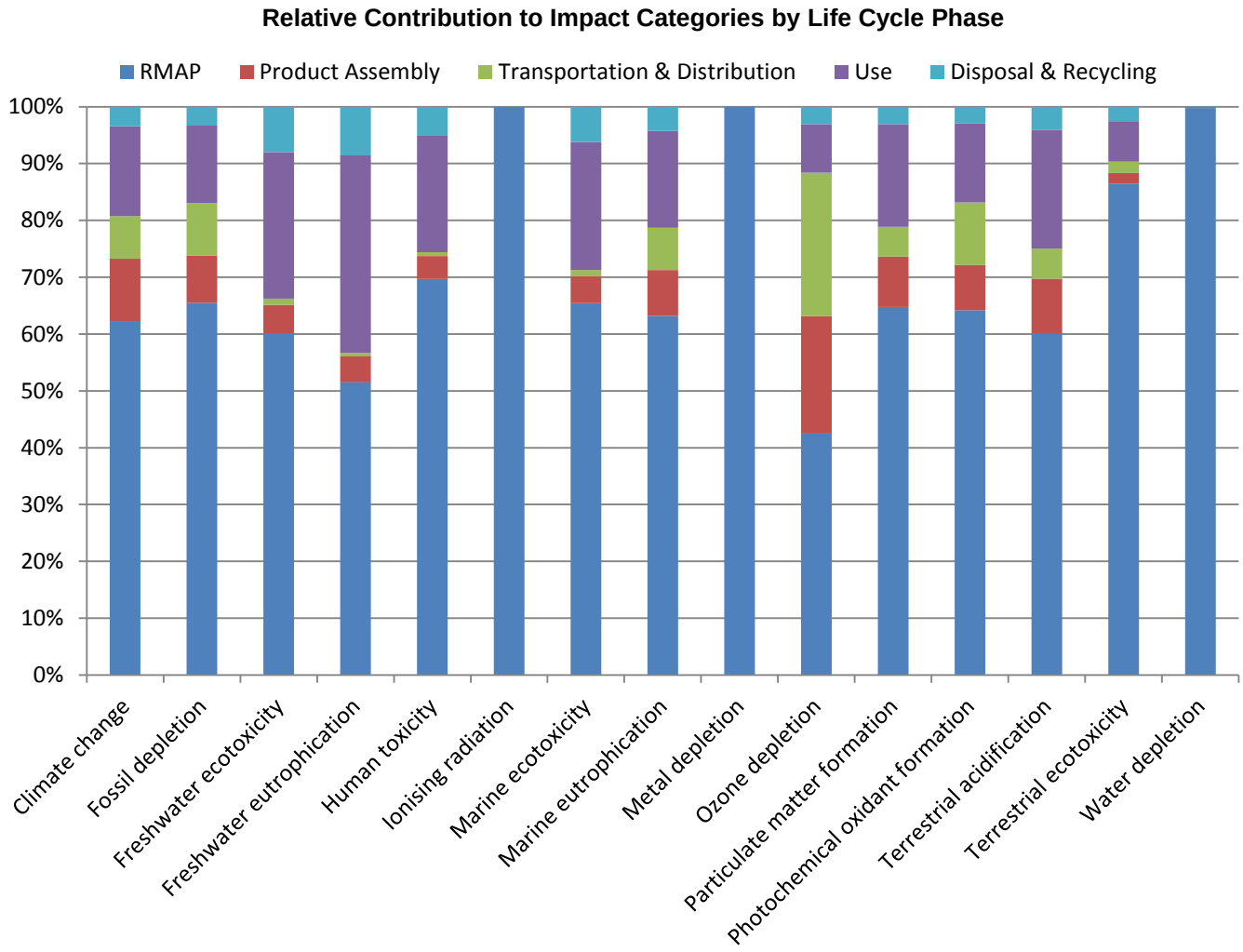
Functional Unit, System Boundaries and Allocation Unit:

The functional unit for this study is a single Momentus XT hard drive in operation for 3 years. The base case of this study assumed product distribution and use in the United States, Europe, and Asia. The drive has a spindle speed of 7200 RPM, 32MB of cache, and is configured with 4096 Bytes per sector.

The system boundaries include raw material extraction, material manufacturing, supplier transportation, product assembly and distribution, packaging, consumer use and assumed end of life (EOL). Burdens from the recycling of product components at EOL are included in the system boundary, but avoided burdens from displaced virgin raw materials are subject to a cut-off and are not included. Systems infrastructure impacts such as the machine tool manufacture or buildings used in product production and assembly have been excluded. All product components were considered in this study with the Bill of Materials provided by Seagate. Burdens at Seagate's assembly plant were allocated on a production unit volume basis.

SimaPro v7.2 software and the Ecoinvent v2.2 database were used during preparation of the LCA. The ReCiPe mid-point hierarchical method was used to determine life cycle impacts for the product life cycle. This study, commissioned by Seagate, was prepared by WSP Environmental, and 3rd party critically reviewed by EarthShift.

Relative Results Summary:



Calculated Impacts:

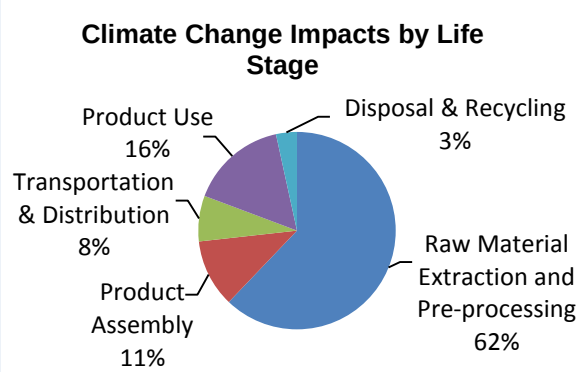
Mid-point Impact		Total
Climate change	kg CO2 eq	1.7E+01
Ozone depletion	kg CFC-11 eq	6.3E-07
Human toxicity	kg 1,4-DB eq	4.0E+00
Photochemical oxidant formation	kg NMVOC	5.8E-02
Particulate matter formation	kg PM10 eq	3.0E-02
Ionizing radiation	kg U235 eq	5.4E+03
Terrestrial acidification	kg SO2 eq	9.0E-02
Freshwater eutrophication	kg P eq	3.1E-03
Marine eutrophication	kg N eq	2.9E-03
Terrestrial ecotoxicity	kg 1,4-DB eq	1.6E-03
Freshwater ecotoxicity	kg 1,4-DB eq	7.1E-02
Marine ecotoxicity	kg 1,4-DB eq	7.1E-02
Water depletion	m3	6.3E+00
Metal depletion	kg Fe eq	1.3E+03
Fossil depletion	kg oil eq	4.5E+00

Climate Impacts

Focusing on Climate Change and Greenhouse Gas (GHG) emissions, we calculate total life cycle GHG emissions at 17 kg CO2e per product. The GHG contributions from each life cycle stage is presented in the pie chart below right.

Raw Material Acquisition and Pre-processing

This phase captures the impacts associated with raw material extraction to finished goods delivered to Seagate's point of assembly and represents 62% of the total product footprint. Component manufacturing is largely determined by the materials used in each component and the energy intensity of component production.



Production

The environmental impacts resulting from product manufacturing and assembly by Seagate for each Momentus XT hard drive were estimated using activity data from Seagate's GHG emission inventory. The data were allocated to the product on a unit volume manufactured basis incorporating all direct and indirect emissions from both production and facility operation including heating and cooling, vehicle fleets, and fugitive emissions. Production accounts for 11% of GHG impacts.

Distribution

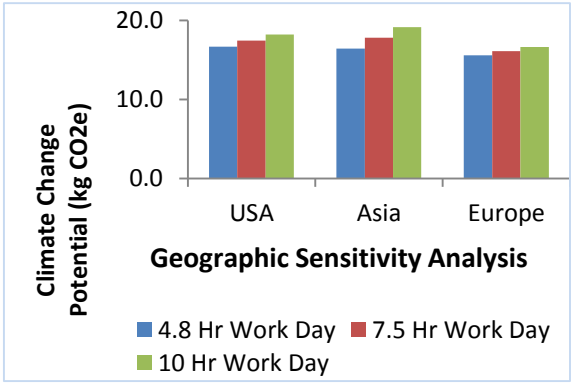
The product life cycle assumes distribution to the United States, Europe, Asia, and shipments to customers from the Seagate assembly site. The total GHG emissions from product distribution amount to 8% of the total life cycle impacts.

Use Phase

Seagate's hard drive power management technology optimizes product performance to minimize the costs and impacts associated with drive power consumption. This study assumes that laptop and desktop Original Equipment Manufacturers use Seagate power management scenarios in their products. The estimated lifetime electricity consumption for the drive is 2.74 kWh, equivalent to the amount of energy needed to power a 60 Watt light bulb for 46 hours. An evaluation determined how the product's climate impacts would change for use in different parts of the world and different usage rates based on different workday durations as represented in the chart to the right.

End of Life (EOL) & Recycling

Although the LCA data for electronic products' EOL/recycling phase has not been well established, and primary data are not available for this product, reasonable estimates of industry practices were made in this analysis based primarily on Ecoinvent unit processes. These processes represent the manual dismantling and depollution, and the mechanical treatment (shredding) of electronic devices. These processes have been considered as representative for the global situation, and applied to the Momentus XT drive, although it is recognized that this will produce an optimistic result for EOL impacts. Recycling of packaging waste was derived from Environmental Protection Agency (EPA) data on Municipal Solid Waste Generation, Recycling, and Disposal in the United States.



Momentus XT SSHD Bill of Substances

The table and chart below illustrate the 35 greatest mass substances in the Momentus XT SSHD drive comprising a cumulative concentration of nearly 99%. Each remaining chemical substance comprises less than 0.1% by weight of the product. Seagate Momentus XT SSHD drives contain no bromine or chlorine above 900 parts per million (ppm) or listed phthalates at the homogeneous material level. In addition, there are no JIG/IEC 62474 restricted chemicals over allowed limits, no ozone depleting chemicals, and no REACH substances of very high concern (SVHC) over 1000 ppm at the article level, as of the date of this writing, owing to subsequent periodic additions to regulated and restricted chemicals lists that may not be accounted for here.
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Substance	CAS Number	Cumulative Concentration of Substances (%)
FE	7439-89-6	40.5405
AL	7429-90-5	66.7579
CRYSTALLINE SILICA	14808-60-7	75.3539
COPPER (METALLIC)	7440-50-8	81.8789
SI	7440-21-3	84.4745
CHROMIUM	7440-47-3	86.63
FIBROUS-GLASS-WOOL	65997-17-3	87.8308
FUSED SILICA	60676-86-0	88.7807
PROPRIETARY		89.6833
NEODYMIUM	7440-00-8	90.5506
BASIC POLYMER: LCP	147310-94-9	91.3986
ACRYLIC POLYMER	37325-11-4	92.0695
NICKEL	7440-02-0	92.7198
"DOPO"	35948-25-5	93.3245
DIIRON-TRIOXIDE	1309-37-1	93.8964
MAGNESIUM-OXIDE	1309-48-4	94.3335
POM	24969-26-4	94.767
POLYESTER MATERIAL	25038-59-9	95.1879
C	7440-44-0	95.5711
MANGANESE	7439-96-5	95.9315
OLIGOMER	73324-00-2	96.2445
POLYURETHANE	9009-54-5	96.5175
SN	7440-31-5	96.7387
GLASS- FIBRE	65997-17-3	96.9516
AL2O3	1344-28-1	97.1499
BARIUM TITANATE(IV)	12047-27-7	97.3424
POLY(BISPHENOL A CARBONATE)	111211-39-3	97.5179
BENZENEDICARBOXYLIC ACID POLYMER	60088-52-0	97.6886
EPOXY RESIN	129915-35-1	97.8575
AG	7440-22-4	98.019
PHTHALOCYANINE,	68987-63-3	98.1734
HOMOPOLYMER	9003-01-4	98.3022
POLYESTER RESIN	68604-67-1	98.4254
POLYACRYLATE	600-07-7	98.5385
HEXAFLUOROPROPENE POLYMER	9011-17-0	98.6499