



Barracuda LP HDD Product Life Cycle Analysis Summary

Product Description

The Barracuda LP HDD is a hard disc drive designed for providing low power and whisper quiet performance for personal attached storage, small office and home storage appliances, and low power PCs. Barracuda is known for its best-in-class acoustic performance and low power demand.



Life Cycle Analysis

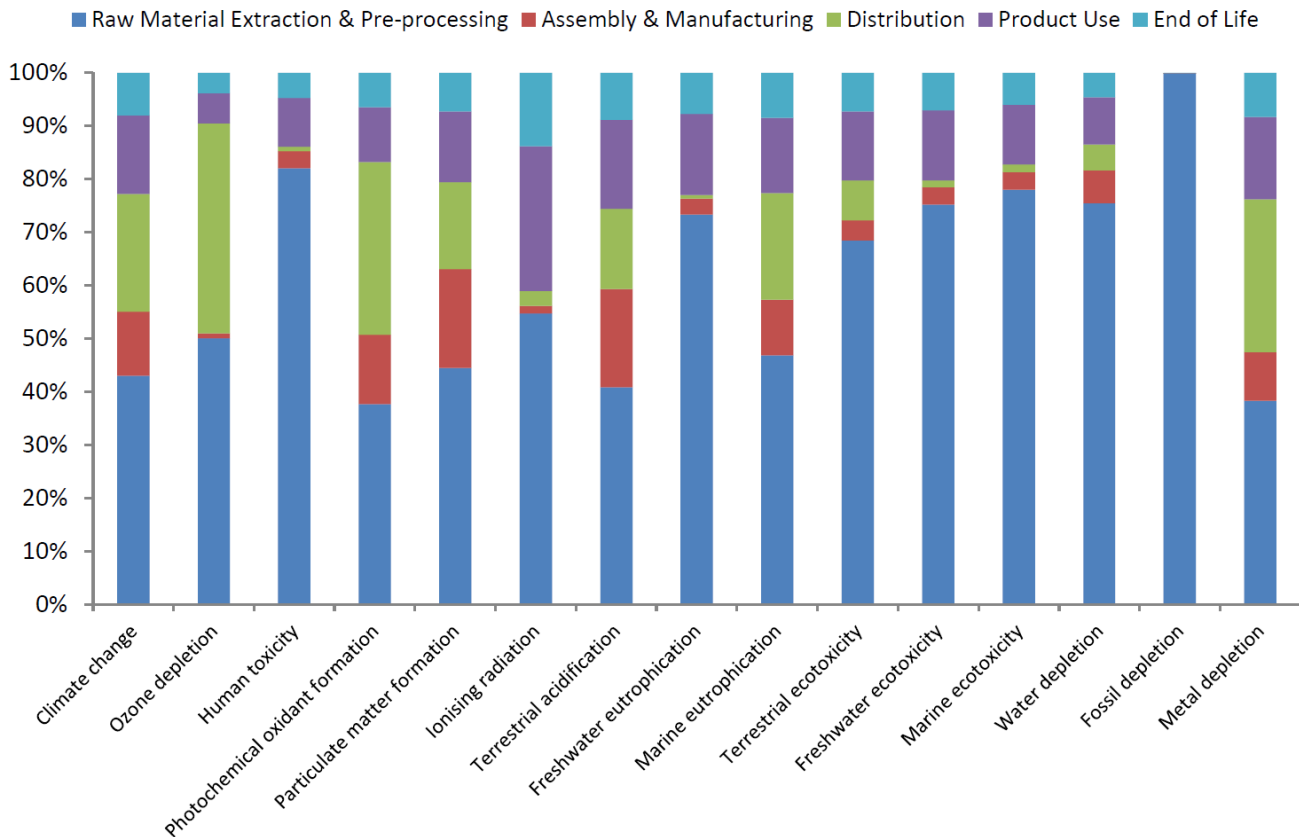
This study is based on a single Barracuda 160 GB hard disc drive in operation for 3 years, assuming product distribution and use in the United States, Europe, and Asia. The drive has a spindle speed of 7200 RPM, 8MB of cache, and is configured with 512 Bytes per sector.

This Life Cycle Analysis takes into consideration the raw material extraction, manufacturing, transportation, product assembly and distribution, packaging, consumer use and assumed end of life (EOL). Systems infrastructure impacts such as the machine tool manufacture or buildings used in product production and assembly have been excluded. All product components in this study were considered using the Seagate Bill of Materials. Assembly impacts were allocated on a production per unit basis.

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

Relative Results Summary:

Relative impacts by product life cycle stage for a 160 GB Barracuda HDD



Calculated Impacts

Mid-point Impact	Unit	Total
Climate change	kg CO2 eq	2.6E+01
Ozone depletion	kg CFC-11 eq	1.8E-06
Human toxicity	kg 1,4-DB eq	1.5E+01
Photochemical oxidant formation	kg NMVOC	8.9E-02
Particulate matter formation	kg PM10 eq	4.4E-02
Ionizing radiation	kg U235 eq	4.1E+00
Terrestrial acidification	kg SO2 eq	1.4E-01
Freshwater eutrophication	kg P eq	1.2E-02
Marine eutrophication	kg N eq	5.0E-03
Terrestrial ecotoxicity	kg 1,4-DB eq	2.0E-03
Freshwater ecotoxicity	kg 1,4-DB eq	2.7E-01
Marine ecotoxicity	kg 1,4-DB eq	2.7E-01
Water depletion	m3	1.2E-01
Metal depletion	kg Fe eq	6.6E+00
Fossil depletion	kg oil eq	6.9E+00

Focusing on Climate Change and Greenhouse Gas (GHG) emissions, we calculate the total life cycle GHG emissions for this drive as 26 CO2e with the percentage contribution from each life cycle stage presented in the pie chart below right.

Raw Material Acquisition and Pre-processing

This phase captures the impacts associated with raw material extraction delivered to Seagate’s point of assembly and represents 43% of the total product footprint. Component manufacturing impacts largely result from the materials used in each component and the energy intensity of component production.

Assembly and Manufacturing

The environmental impacts resulting from product manufacturing by Seagate for each Barracuda LP hard drive were estimated using activity data from Seagate’s GHG emission inventory. The data were allocated to the product on a unit manufactured basis, incorporating all direct and indirect emissions from both production and facility operation including heating and cooling, vehicle fleets, and fugitive emissions.

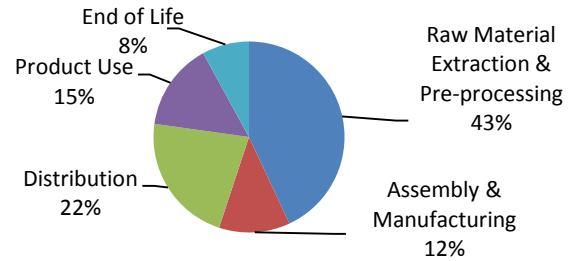
Distribution

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 is 22% of the total life cycle impact.

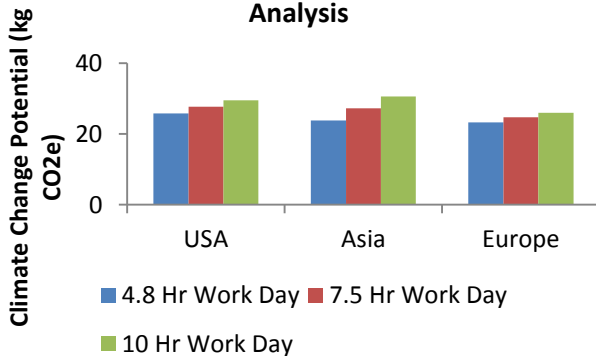
Use Phase

Seagate’s desktop power management technology optimizes performance to minimize impacts associated with drive power consumption. The estimated lifetime electrical consumption for the drive is 4.62 kWh, equivalent to the amount of energy needed to power a 60 Watt light bulb for 3.2 days. 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 below.

Climate Change Impacts by Life Stage



Geographic Distribution Sensitivity Analysis



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, estimates of industry practices were made based primarily on Ecoinvent unit processes. These processes represent the manual dismantling and depollution, and the mechanical treatment (shredding) of electronic devices. These processes are considered as globally representative, and applied to the Barracuda drive, although it is acknowledged 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.

Barracuda LPP HDD Bill of Substances

The table and chart below illustrate the 21 greatest mass substances in the Barracuda disc drive comprising a cumulative concentration of nearly 99%. Each remaining chemical substance comprises less than 0.1% by weight of the product. Seagate Barracuda LPP HDD disc 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.

Substance	CAS Number	Cumulative Concentration
ALUMINUM	7429-90-5	61.9451
IRON	7439-89-6	80.5984
COPPER (METALLIC)	7440-50-8	86.12
SI	7440-21-3	90.705
CHROMIUM	7440-47-3	93.1778
NICKEL	7440-02-0	94.862
ZINC	7440-66-6	95.6614
FIBROUS-GLASS-WOOL	65997-17-3	96.141
NEODYMIUM	7440-00-8	96.5053
MAGNESIUM (METAL)	7439-95-4	96.8692
MANGANESE	7439-96-5	97.1983
LCP POLYMER	147310-94-9	97.5019
POM, POLYOXYMETHYLENE COPOLYMER	24969-26-4	97.7305
"DOPO" HALOGEN-FREE FLAME RETARDANT	35948-25-5	97.9132
POLYESTER MATERIAL	79-14-1	98.086
ACRYLATE URETHANE OLIGOMER	73324-00-2	98.2507
PROPRIETARY	SYSTEM	98.3749
EPOXY RESIN	129915-35-1	98.4961
ACRYLIC POLYMER	37325-11-4	98.6128
FUSED SILICA	60676-86-0	98.7214
TIN	7440-31-5	98.8116

