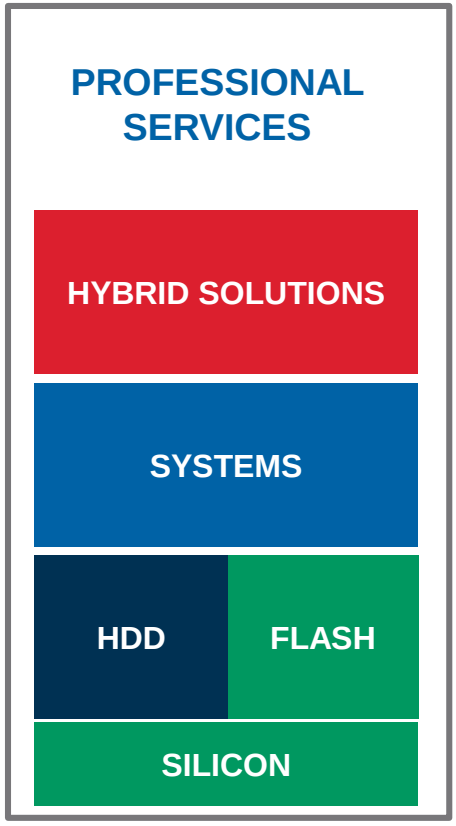
Measuring Seagate's Chemical Footprint

Annie Schmidt
Seagate Technology
Product Sustainability
Senior Staff Program/Project Manager

SEAGATE | EHS & Sustainability



SEAGATE combines

DIFFERENT TECHNOLOGIES in new ways

to SOLVE customer data storage CHALLENGES

- Seagate stores 40% of the world's data
- Broad scalable portfolio
- Silicon, component, system and software innovation
- Technology leader with 9000+ patents
- ~ 52,000 employees worldwide
- ~$15 billion in annual revenue

Seagate Global Presence

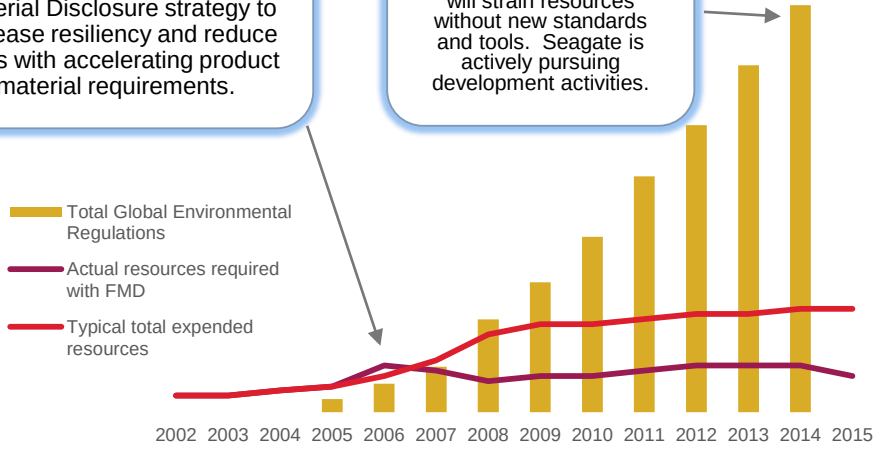
Measuring Seagate's Product Chemical Footprint: Full Material Disclosure (FMD)

- What is FMD?
  - Seagate's system for collecting supplier component, parts and materials information on all products
  - Data loaded to database supported by restricted substance lab reports
- What drives FMD?
  - Global regulatory and customer requirements
  - Customers require documented product material content compliance to RoHS, REACH, and their specific product substance restrictions
  - More cost effective for Seagate
- How does Seagate accomplish FMD?
  - Compliance Assurance System (CAS) database loads supplier data via IPC 1752
  - CAS informs supplier annually to refresh data
  - Database evaluates supplier data against global regulations and customer requirements
  - Produces data for customer/customs inspection reports

Substance restrictions: compliance with specifications and data/documentation requirements

Seagate invested in CAS* System and developed Full Material Disclosure strategy to increase resiliency and reduce costs with accelerating product material requirements.

Accelerating restrictions and data output demands will strain resources without new standards and tools. Seagate is actively pursuing development activities.



Compliance to all applicable regulatory and customer requirements

- RoHS, REACH, RoHS 2, China RoHS, Regional restrictions (Canada, etc.)
- Halogen-free, phthalate-free, and myriad other voluntary restrictions

Alignment to standards

- IPC 1752 materials reporting format
  - Open, industry data standard
  - IPC 1753 is a new lab report data standard. Seagate led this effort.

'FMD' – Full Materials Disclosure

- Manage compliance to changing regulations and customer specifications restricting toxic substances

Stability

- Supplier reporting requirements and formats seldom change

Security

- Supplier data are kept confidential

Supplier responsibility

- Suppliers must participate and must provide all required data

Closed loop resourcing

- The same resources manage both supplier data AND customer reporting

Low cost, best-practice compliance

- Best compliance, fastest response, lowest cost

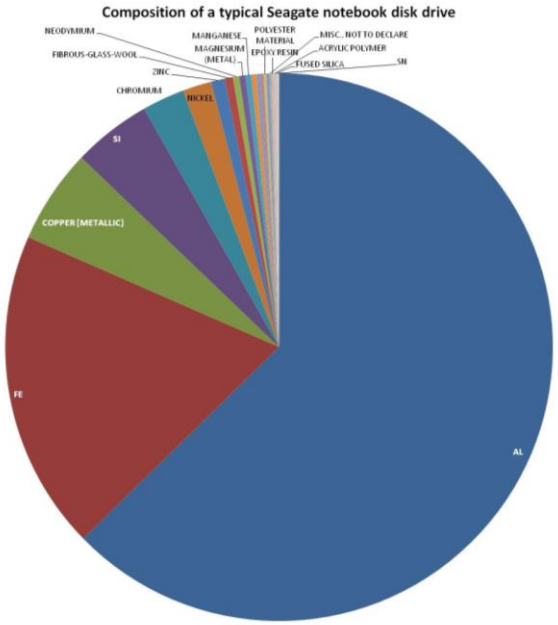
Product Lab Test Requirement

Requirement to report what is in our products

- What is the Product Lab Test Requirement?
  - Final product test prior to customer ship authorization
  - Use samples with materials representative of normal production
  - ISO 17025 certified independent 3rd party product teardown, “grind and find” analysis for restricted substances
- What drives Lab Test Requirement?
  - Global regulatory and customer requirements
  - Requirement for doing business globally and with specific customers
  - Customers require documented product material content compliance to RoHS, REACH, and their specific product substance restrictions
- How does Seagate meet this requirement?
  - Seagate’s standard operating procedure
  - Product Stewardship specification
  - Audit Lab Test Specification

Supplier FMD data allows production of a product bill of substances

Composition of a typical Seagate desktop disk drive



Assembling a bill of substances isn't easy…

- A representative bill of materials must be established to represent an entire product family
- A new "virtualization algorithm" was developed
- Bill of substances software development followed the virtualization algorithm

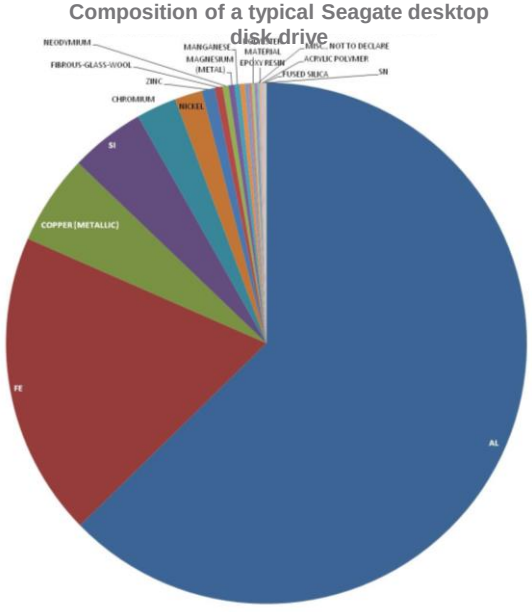
The Bill of Substances enables transparency

- Communicate the chemical ingredients of a finished disk drive
- Supplier confidential data are protected, as no part-level data are disclosed
- Algorithms, software were extensively tested, but have not been third-party reviewed
- We publish bill of substance data on our public website

Seagate disk drives do not contain:

- Br or Cl above 900 ppm (Homogeneous Material level)
- Listed phthalates* ("phthalate free") (Homogeneous Material level)
- JIG/IEC 62474 restricted chemicals (over limits)
- REACH SVHCs over 1000 ppm (Article)
- ODCs

Assembled Bill of Substance for a Desktop Disk Drive



Substance	CAS Number	Cumulative Concentration
AL	7429-90-5	61.9451
FE	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	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
SN	7440-31-5	98.8116

The Seagate supplier specification restricts almost 2000 CAS numbers

Chemical Footprint and FMD

- Core Products
  - Fully compliant with FMD
  - Up to 5% can be undisclosed at the homogeneous material level
- Products from Seagate acquisitions
  - In varying stages of progress toward FMD compliance
  - Product and supply chain complexity drive time to compliance
- Encouragement of safer alternatives use
  - Hazards evaluation driven by regulations and customer requirements

Emerging Risks—Process Chemistry

CFP offers an objective benchmarking and tracking tool for product chemistry
--Process chemistry is the next frontier

Customer process chemistry disclosure requirements

- Manual process
- Significant resource and time effort to fulfill
- Predictor of more frequent and extensive reporting requirements

NGO process chemistry focus

- “**People are dying to make our phones and computers.”***
- While most sustainability efforts focus on product sustainability, the volume of process chemicals not incorporated into products is conservatively estimated to be 4 times that of product chemistries

*http://goodelectronics.org/news-en/no-more-deaths-in-electronics-sweatshops, accessed 11/18/15.