WHOI OBS Media Selection

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WHOI OBS Baler 14

- >70 Quanterra Baler 14s in operation
- ~1/2 are lightly modified “desktop balers”
- Other 1/2 are “field balers” repackaged to fit into a desktop baler case
- Operationally both types are 100% equivalent

WHOI OBS Baler 14

- As of December 2015 all B14s had original 20GB HDD
- Hitachi Endurastar J4K3020 (or older)
- Low rotational speed single platter automotive drive
- Very few drive failures seen
- No data loss due to failure
- Extremely reliable!

Desire to upgrade

- Higher capacity for longer recording (50GB max)
- Aging drives
- Power savings
- Altitude restrictions

Beartooth Pass
10,947ft
~330mBar

By Phil Armitage - http://www.philarmitage.net/beartooths/beartooths02.html, Public Domain

Risks to upgrade

- Hard to beat current reliability
- Hard to match current track record
- Need large run to avoid batch variations
- Few current vendors provide IDE interface

Quanterra sourced 50GB HDD

- HGST J4K50 – updated version of previous 20GB HDD
- Quanterra: seems very reliable, albeit with less of a track record than the 20GB
- Rated to 5000m altitude – OK for all US mountain passes, though still below our target 500mBar vacuum

Quanterra sourced 50GB HDD

- HGST J4K50
- Automotive HDDs no longer manufactured
- <10 remaining at Quanterra
- Doesn’t address power

Hard disk drives vs solid state drives

HDD

- Magnetic storage / spinning platter
- Shock while operating may damage
- Requires air to balance platter
- Motor requires high peak current
- Old technology – well tested, but no longer manufactured

SSD

- Flash memory / no moving parts
- Resilient against shock
- Operates at any air pressure
- Lower power? At least lower peaks?
- Newer – less track record, but many current vendors

Solid State Drive comparison

Single Level Cell (SLC)

- Each flash cell is either “on” or “off”, i.e. one bit
- Inherently more reliable
- Longer lasting (10x write cycles)
- Older technology

Multi Level Cell (MLC)

- Each flash cell stores one of 4 levels, i.e. two bits
- More prone to bit error
- Fewer write cycles

Solid State Drive comparison

Single Level Cell (SLC)

- Very rarely used
- Controllers less stable
- Much more expensive

Multi Level Cell (MLC)

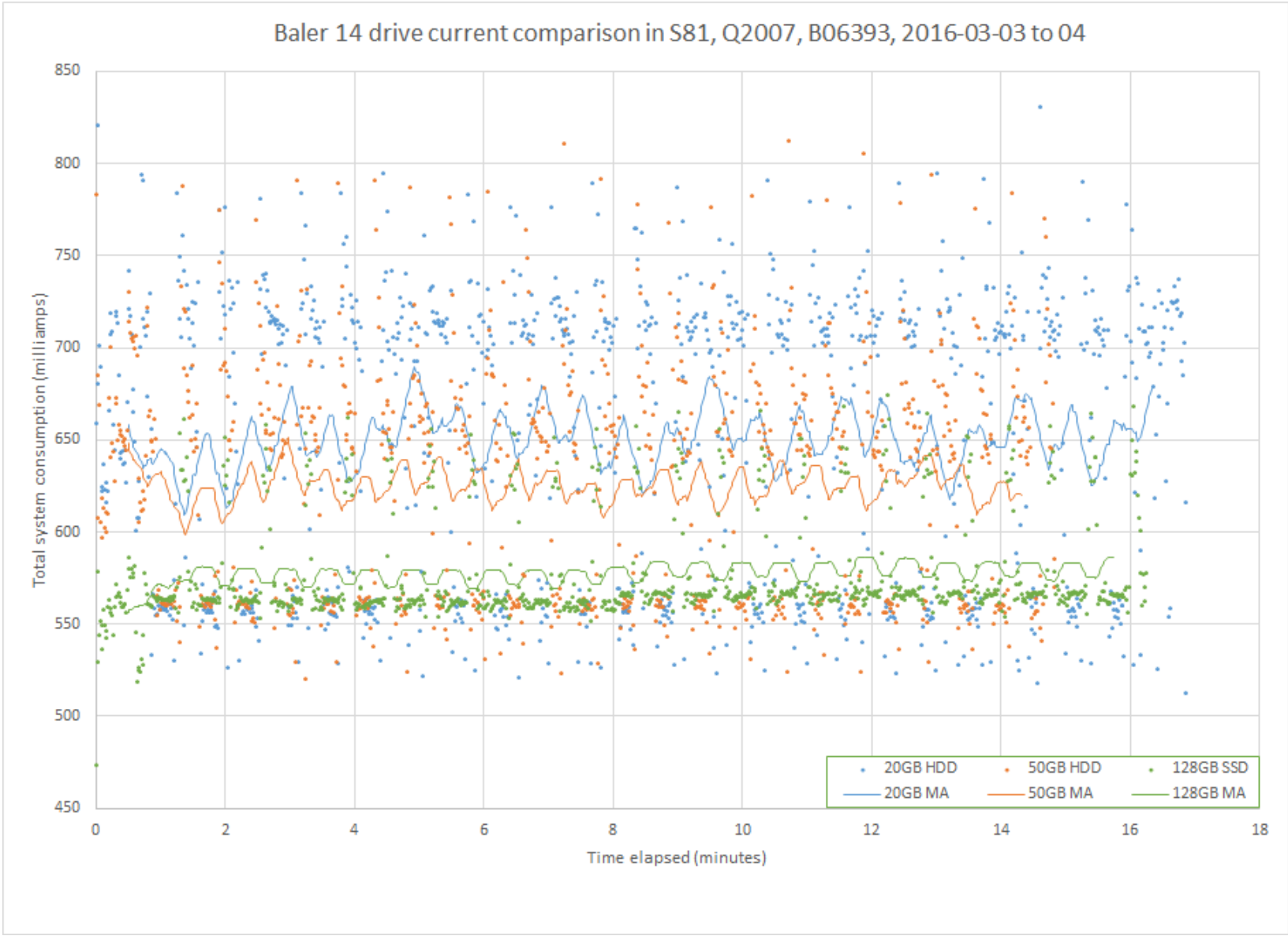
- Ubiquitous
- Firmware tested in millions of units
- Cheap (~5x cheaper per GB)
- Current wear levelling and garbage collection routines minimize the impact of lower cycle life
- Quanterra has recommended MLC drives for the Baler 44s for years now

Where we are now

- 12 balers have 50GB HDDs from Quanterra
- 2 balers have trial 256GB MLC SSDs from Supertalent
- ~1.5months total runtime between both SSDs in accelerated write testing

Where we are now

- 1 SSD cloned in house from 50GB HDD using USB-IDE enclosure and Clonezilla Live
- 1 SSD cloned by Quanterra
- No issues seen so far
- Power comparison is favorable


Baler 14 drive current comparison in S81, Q2007, B06393, 2016-03-03 to 04
Total system consumption (milliamps)
850
800
750
700
650
600
550
500
450
0
2
4
6
8
10
12
14
16
18
Time elapsed (minutes)
20GB HDD
50GB HDD
128GB SSD
20GB MA
50GB MA
128GB MA

The future

- More testing (have already written 50GB to one drive and 35GB to the other)
- Trial drives are commercial temp!
- Need large (50pc) order for industrial temp

Physical Specifications

	DuraDrive ET3
Form Factor	2.5”
Capacity	32-512GB(MLC),16-64GB(SLC)
Dimensions	100.2 x 69.85 x 9.5 mm
Interface	IDE/PATA
NAND Flash	MLC/SLC
Power Supply	5V ± 10%
Package	Complete metal housing

Environmental Specifications

Shock (Operating)	1500G
Vibration (Operating)	16G
Operating Temperature (Industrial)	-40°C ~ 85°C
Operating Temperature (Commercial)	0°C ~ 70°C