

# Automating Sample Management without Losing Sight of Sample Quality

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### Abstract

The Brooks A3 SmaRTStore™ is a flexible, compact and space efficient automated sample storage system adopted by increasing numbers of organisations, ranging from academia through biobanking to large pharma. With the highest density storage in its class, A3 SmaRTStore™ has been proven to deliver reliable, flexible and high integrity automated sample management.

Brooks Tube Auditor™ is a high-speed, non-contact volume measurement and precipitate detection instrument for SBS format microtubes. Offering significant benefits over manual and other semi-automated solutions, this instrument facilitates rapid and accurate determination of sample quantity and quality.

In many organisations it is standard practice to subject samples to a purity check before being loaded into an automated store; however, measurement of the sample volume, or inspection for precipitates, either does not occur or is only undertaken on a random sample basis and/or subjectively (for example, as a result of manual inspection). This can ultimately lead to problems further along the drug discovery / development process.

This poster will demonstrate how utilising high-speed sample auditing in conjunction with automated sample storage is helping customers rapidly identify problem samples, and thus improve the quality of their stored collection.

### Automated Sample Storage For Smaller Screening Groups

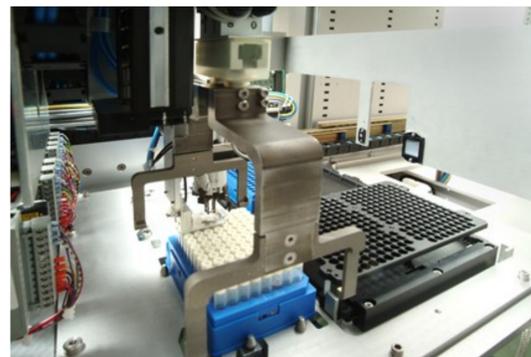
Automated sample storage increases throughput, allows tracking of samples, reduces manual errors, and frees resources to undertake other activities.



Until recently, smaller screening groups have been unable to benefit from these advantages as automated sample storage systems were either too large, too complex or too expensive.

However, it is now possible to implement automated sample storage by using lower-cost productised systems, such as the A3 SmaRTStore™ available from Brooks Life Science.

These systems, suitable for sample collections up to 500,000 tubes, offer all the same benefits as more traditional automated storage solutions, but with the advantages of extremely small footprints, and minimal facilities requirements. This makes them ideal for organisations where there is a premium on laboratory space.

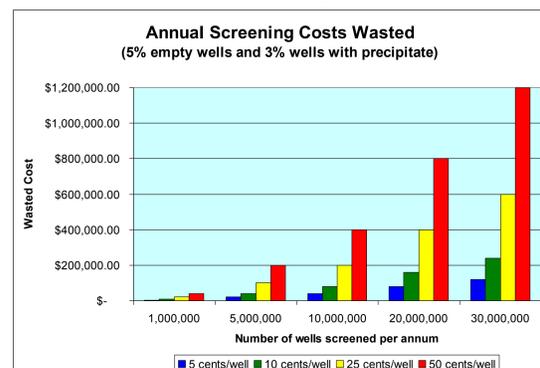


With full cherry-picking capabilities, for both tubes and vials, support for storage temperatures down to -20°C, and inert environment options, the A3 SmaRTStore™ systems are ideally suited for supplying medium to high throughput screening demands.

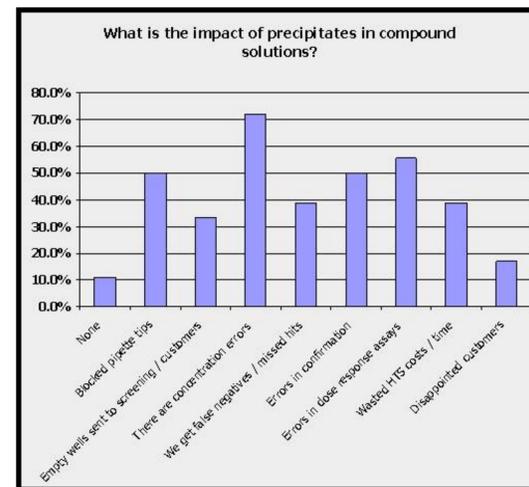
### Sample Quality

Compound managers responsible for delivering samples in plate format to screening groups need to have confidence in the quality of their delivered product.

Empty plate wells, or wells with samples at the wrong concentration, can have a significant effect on the end results from the screening process and can result in significant cost wastage.



Survey data gathered by Brooks suggests that as many as 5% of plate wells may be empty, and 3 to 5% of wells may have samples at the wrong concentration.



Problems, commonly caused by precipitates in compound solutions, not only lead to poor quality screening results, but also significant cost wastage, as shown in the chart above.

As in most cases the originating sample will be stored in solubilized form in tubes, it is thus beneficial to know:

- If there is any sample in the source tube
- How much volume of sample is in the tube
- If any of the sample has precipitated out of solution

### Brooks Tube Auditor™

A high-speed, high-resolution vision system is used to image multiple sample tubes simultaneously. The image is analyzed and the liquid meniscus detected for each tube being audited.



Once the position of the meniscus has been determined, the volume of liquid is calculated, taking into account tube and liquid types. Further algorithms are used to detect the presence of a cap and any precipitate in the base of the tube.

Feature	Tube Auditor	Tube Auditor Pro
Volume Measurement	✓	✓
Cap Detection	✓	✓
Manual and Remote Operation	✓	✓
User Interface Software	✓	✓
Precipitate Detection		✓
Image Capture and Recall		✓

### Benefits of Using Vision

- High-speed - less than 2 minutes for a 96 tube rack
- Accurate - volume measurement better than +/- 10µl
- Precipitate detection
- Cap detection
- No need for tare-weighing
- Non-contact and operates with capped tubes
- Empty tube detection

### Ensuring Sample Quality

Organizations are advised to audit samples upon receipt, prior to entry into the storage system. This allows an accurate baseline to be set in the sample tracking database and also allows any quality issues to be reported immediately to the laboratory or external supplier.

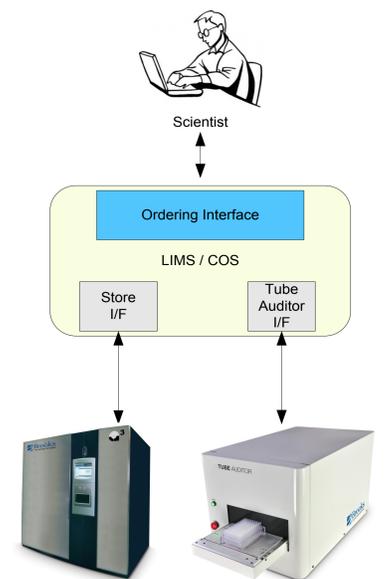
Knowing the sample quality and volume from day one ensures that all requests for samples from the store can be accurately assessed prior to cherry picking and dispatch.

Where samples are returned after external processing it is recommended that they are re-audited before being placed back in the store.

Where closely coupled or directly integrated liquid handling operations are performed it is often acceptable to perform periodic auditing with the audit period being automatically determined based on aliquot volumes or frequency.

### An Integrated Solution

It is common for the Tube Auditor™ to be integrated into a customer database or LIMS system as shown in the following diagram.



### Applications

High-speed tube auditing may be used at multiple points in the CM / HTS process, as illustrated below:



In addition, this technology may also find applications in:

- Biobanking
- Sample quality control and empty tube detection
- Sample dissolution and solubility quality checks
- Cap detection (avoid liquid handling tip damage)

In particular, testing has shown good performance when auditing DNA (in buffer) and other biological fluids.

### Conclusion

Recent developments in vision technology have enabled accurate, non-contact, non-invasive assessments of quality and volume to be made for samples held in microtubes.

Instruments such as the Brooks Tube Auditor™ are helping to improve the quality of sample collections and the accuracy of liquid handling operations.