Storage, Automation & Logistics

APPLICATION NOTE

Faster Compound Management Workflows: Part I: A Connected Approach to High Throughput Screening

HighRes biosolutions

AZENTA LIFE SCIENCES

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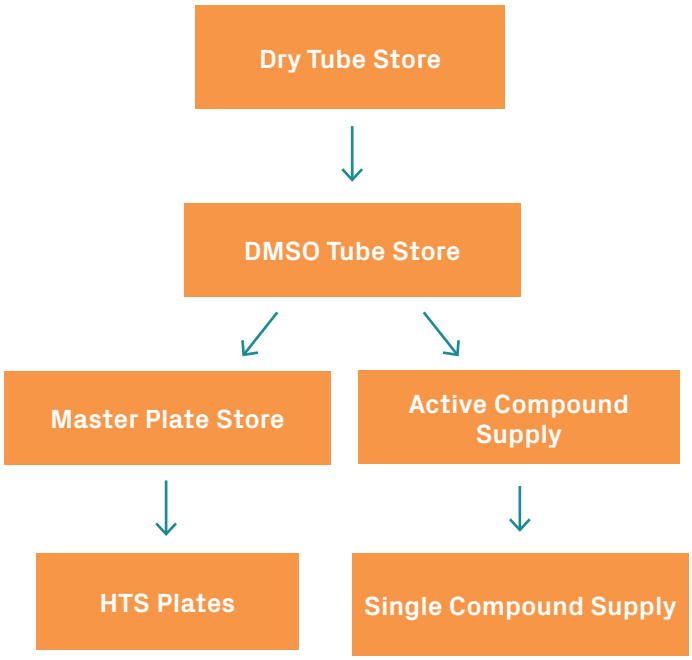
Introduction

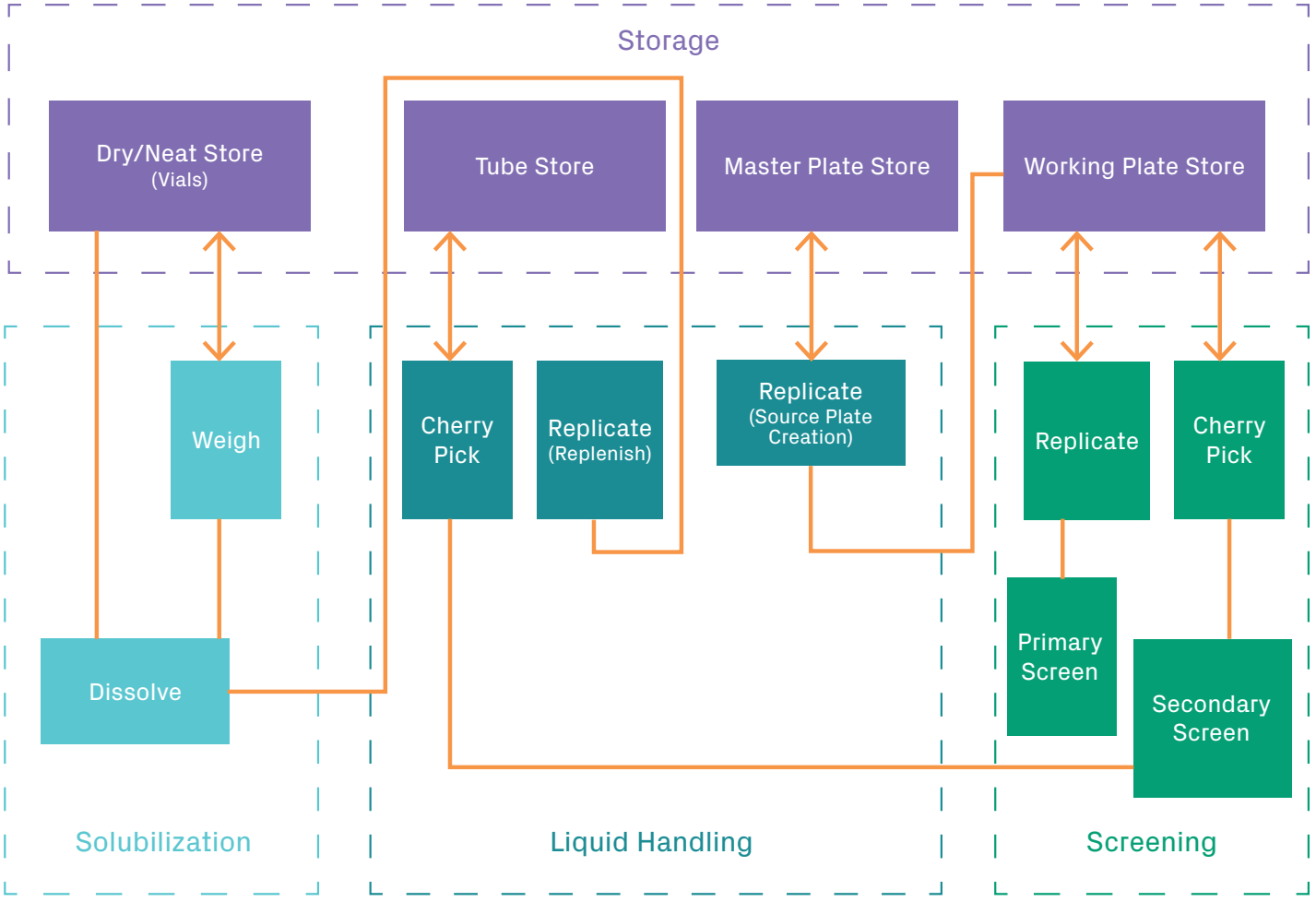
In recent years Compound Managers have seen a significant increase in the size of pharmaceutical compound collections from hundreds of thousands to millions. Today, many companies can screen millions of compounds through hundreds of targets per year with each campaign lasting only a matter of weeks. As the diagram below illustrates, compounds can be stored in a 'Wet' or 'Dry' format. Wet or dry refers to storing compounds as solids or dissolved in solvent such as DMSO. DMSO is very hygroscopic, so, when exposed to the atmosphere, it absorbs moisture and will continue to do so. As a result of this, many organisations opt for a temperature controlled compound management solution.

Protecting the integrity of compound collections and providing high-quality materials for drug discovery in an efficient and cost-effective manner are 2 major challenges faced by compound managers. Transfer of large numbers of solid samples that can be in the hundreds of thousands continues to be a challenge for compound management.

Establishing an efficient chain of condition, custody and identity while rapidly providing compounds as solids or liquids in a variety of formats with temperature controlled storage is vital for delivery to sensitive biological assays. Storage temperature and environmental conditions will have a significant effect on the transfer of compounds into screening plates, otherwise known as the compound replication process, and freeze–thaw cycles should be minimized as should DMSO exposure to the atmosphere.
An effective way to manage this process is to use an Automated Storage System such as the Azenta Life Sciences SampleStore™ to manage a compound collection throughout the workflow. An Example of an integrated workflow for Automated Storage and High Throughput Screening (HTS) can be seen below.



Compound Management Automated Storage Workflow Integration



Automated Compound Storage

- **Standard configurations include:** 12 columns up to 170 columns of storage capacity
- **Collection variability:** Handle your changing compound collections: SampleStore is designed to handle a diverse set of container types and evolve with your collection. Increase capacity or change picking and input/output modules to meet future requirements or container types.
- **Standard module options:** Standard configurations include -20°C picking modules as well as input/output.
- **Sample flexibility:** Sample picking modules are designed for a wide range of containers, including SBS formatted tubes, vials, plates or racks.
- **Easy to service:** The picking and input/output modules can be serviced from outside without disturbing the stored samples or bringing moisture into the storage compartment.
- **Maximize storage density:** Dynamically allocated storage space; even if your sample containers change, storage capacity will be optimized.

Capacities	**300,000 to over 10,000,000** samples (sbs format, 96 way tubes)
Lengths	**2.1m to 20m** (7' to 66')
Heights	**2.6m to 4.5m** (8' to 15')
Throughputs	up to **100,000** samples picked per day

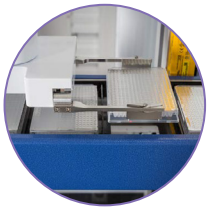
Automation Integration - AIM

The AIM delivers samples to (or conversely, receives samples from) a 6 Position SBS Rack Tray on its external diving board location. Any samples that can be presented onto SBS format racks (whether tubes, vials or plates) can be interchanged in this manner and as a result this system is compatible with 96, 384, and 1536 plate formats often used in high throughput screening. Samples are transferred to and from the AIM via the HighRes ACell Robot to HighRes storage modules. The storage devices use the MicroDock/ MicroCart technology from HighRes to transport samples between systems.

- Supports reduced turnaround time
- Greater overall throughput and reduction of manual processing
- Enables direct integration with automation platforms
- Supports any samples (tubes, vials and plates) stored on SBS format racks

Typical Applications

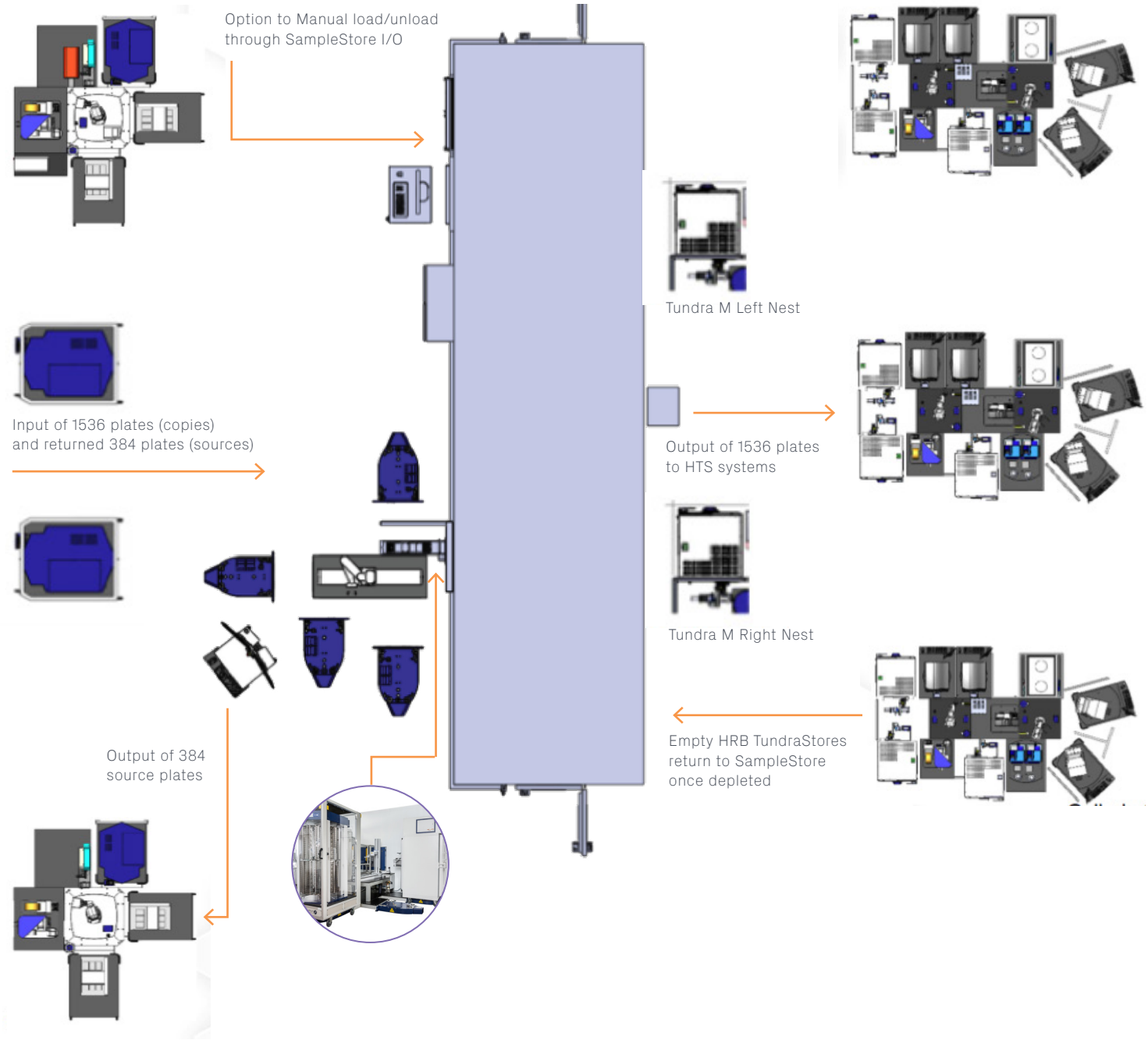
- Carousel based Input/Output to enable easy transfer of samples to/from a detached platform
- Sample thawing, centrifuging, auditing, tube picking and carousel Input/Output
- Liquid handling platforms:
- Replication
- Compression
- Serial Dilution
- Assay ready plate production



Compound Management and Screening Workflow Automation

Connected Workflow

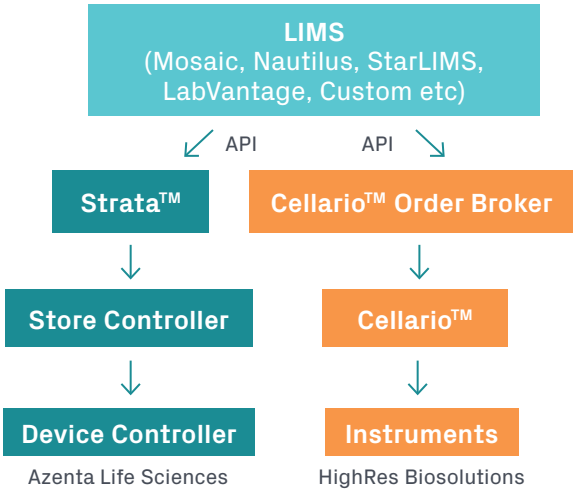
Azenta Life Sciences SampleStore delivering plate on SBS racks to the AIM module where a HighRes ACell robot loads the plates into AmbiStores or TundraStores. The client utilizes the HighRes MicroDock/MicroCart technology to move samples from the SampleStore to various HighRes robotic solutions.



Software Integration and Scheduling

Strata software is the high-performance engine that drives the sample management process in Azenta Life Sciences SampleStore. The software simplifies integration with corporate IT systems and LIMS that support Web services and other technologies. It ensures reliable performance via intelligent diagnostics and error recovery.

- Sample lifetime inventory tracking
- Environment tracking and monitoring
- Chain of custody / audit trail reports
- Robust data security
- User authentication (Windows Active Directory)
- Configurable user defined roles
- Highly granular access levels
- Industry-standard Oracle database
- Integrated to 30+ inventory / LIMS: Nautilus, StarLIMS,
- LabVantage, Mosaic, custom...



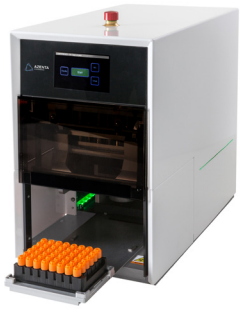
Cellario is the mastermind behind all HighRes systems and integrations. Cellario is designed to be intuitive and easyto-use, enabling lab operators to gain sufficiency in just a couple of hours. It has a wide range of powerful features that enable meticulous control over how the system runs and options for automatic recovery from error scenarios such as instrument failures. Cellario's intelligent scheduling behavior, support for a wide range of instruments, and robust errorhandling make it a dependable assistant in your laboratory's processes.

Underneath Cellario is a powerful multi-layered application programming interface (API) for adapting Cellario to your laboratory's processes. This API enables HighRes to tightly integrate Cellario with your Laboratory Information Management Service (LIMS), internal software, or custom HighRes-provided software. Through native scripting, hooks, execute steps and decision nodes, you can create custom runtime and assay behavior for your most complex assays.

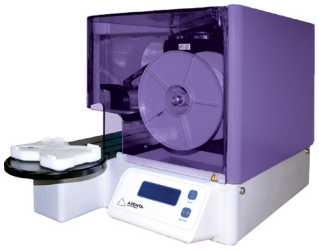
Safe Efficient High-Throughput Screening

With lab space and processing speed amongst the key considerations when planning an automated solution, this connected approach combines the Azenta SampleStore, a space efficient automated store and appropriate instruments into an optimsed cell layout for both flexibility and speed. Examples of docked and fixed table instruments include:

- Azenta Automated Plate Seal Remover
- Agilent Plateloc
- Azenta IntelliXcap™
- HiRes Microspin
- Thermo Multidrop
- HiRes Tundrastore
- HiRes ACell
- Beckman Coulter Life Sciences Echo
- HiRes LidValet etc



Azenta IntelliXcap: Full rack capper and decapper capable of decapping a complete rack of 96 tubes in as little as 20 seconds



Azenta Automated Plate Seal Remover: Allows fully automated seal removal in a wide variety of sample storage environments

Top Pharma Customer Case Studies

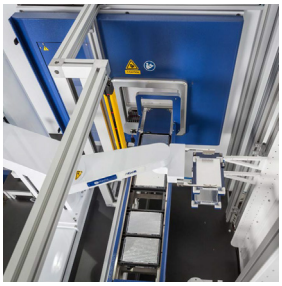
Use Case #1: Input and storage of Compound 'Master Plate' collection. Scenario: 384 well plate sets will be created using the HighRes Biosolutions HTS plating support platforms.

Use Case #2: Input and Storage of High-Throughput Screening (HTS) Plates. Scenario: 384 Masters will be used to create copies of the HTS plate sets using the plating support platforms.

Use Case #3: Input and Storage of Specialty Collection Plates. Scenario: Load and store smaller plate sets in variable densities (96, 384, 1536) for storage within the SampleStore.

Use Case #4: Output of 1536 HTS Plate Sets. Scenario: Output copies of 1536 HTS Plate Set to be output from the SampleStore and loaded into HighRes Biosolutions storage device via the AIM.

Use Case #5: Output of 384 Master Plates for 1536 HTS Plate Set Creation. Scenario: The user will request subsets of the 384 Master Plate Set to be output by the SampleStore for creation of 1536 HTS plate sets. Once processed, all plates will be returned to the SampleStore for input and storage.



Use Case #6: Output of Speciality Collection Plates. Scenario: The user will request plates to be output from the SampleStore to either the Azenta Life Sciences I/O or via the AIM to a HighRes Biosolutions storage device.

Use Case #7: Ad-Hoc Input of plates. Scenario: The user will input a plate (or plate set) into the SampleStore on demand. Plates will have barcodes required for inventory tracking and management and conform to all SampleStore operational requirements.

Use Case #8: Ad-Hoc Output of plates. Scenario: The user submits an Output request for a plate (or plate set) from the SampleStore. Users will have the ability to output plates via the Azenta Life Sciences I/O or via the AIM, depending on plate set size. Plates will have barcodes required for inventory tracking and management.

Use Case #9: Store 'Housekeeping' Processes. Scenario: The SampleStore will employ 'housekeeping' processes to manage storage & maximize picking and placing efficiency. Storage optimisation operations can be executed either in a fully automated (no user prompted operation) or manual (user prompted operation).

Conclusion

Integrating and matching the throughput of an automated storage system to the compound management workflow is critical to realise downstream process efficiencies. Even with automation this can involve multiple vendor solutions requiring human intervention at various stages leading to throughput bottlenecks. The solution provided by Azenta Life Sciences and HighRes Biosolutions gives the end-user a powerful platform for managing daily compound management operations, keeping track of sample movements, and meeting downstream research goals.

A connected approach utilising the strengths of multiple vendors to achieve a seamless automated workflow can lead to improved timelines for screening and hit identification through to lead optimization and candidate selection while protecting the integrity of the compound collection in an automated storage and retrieval system.

Faster Compound Management Workflows from Azenta Life Sciences & HighRes Biosolutions

AZENTA LIFE SCIENCES

Azenta Life Sciences provides unrivaled sample exploration and management solutions to help our customers accelerate discovery, development, and delivery to bring impactful breakthroughs and therapies to market faster. We are the global leader in automated compound management for drug discovery, biological storage, and sample processing solutions. Azenta understands the importance of sample integrity and provides a comprehensive range of solutions across our leading capabilities of genomic services, sample repository services (SRS), consumables and instruments, data management and informatics, sample sourcing, and automated ultra-cold storage.

HighRes biosolutions

HighRes Biosolutions provides innovative laboratory automation systems, dynamic software solutions, and lab automation devices with superior technology to accelerate and streamline discovery. We offer highly flexible, modular and mobile robotic solutions that provide you the ability to scale and reconfigure automation systems as your science or technologies change.