



AZENTA
LIFE SCIENCES



Integrating an Azenta Life Sciences Automated Store with your Mosaic Software using Titian's Automated Stores (AMS) Application

Tim Stroud, Titian Software Ltd
Dean Montano, Azenta Life Sciences

v2.0

INTRODUCTION

Manual methods of storing and retrieving samples are slow and inefficient in comparison to automated ones, so it is a natural step for companies to consider adding automated storage systems to the sample management workflow as the business grows. The ability to easily and comprehensively integrate the chosen store into your workflow management provides multiple benefits and efficiencies.

BENEFITS OF USING AN AUTOMATED STORE

Automated stores, such as Azenta Life Sciences (formerly Brooks) SampleStore™ or BioStore™, log each sample into and out of storage, provide high throughput sample access, improve sample integrity and greater space efficiency. Because freezer doors do not have to be opened for prolonged periods of time, temperature fluctuations are greatly reduced. This has the additional benefit of reducing energy consumption and prolonging the life of your freezers, as they do not have to be repeatedly brought back down to the correct temperature.

BENEFITS OF USING SAMPLE MANAGEMENT SOFTWARE

Sample management software, such as Titian's Mosaic, is designed to lift the load from scientists and operators by automatically recording and updating details of lab sample operations to reliably track each sample throughout its life cycle. As well as inventory management, Mosaic provides a comprehensive audit trail, easy search facilities, order management, reporting and integration with lab automation. These processes result in improved data integrity, cost savings and workflow efficiencies as well as peace of mind.



WHY INTEGRATE AN AUTOMATED STORE WITH SAMPLE MANAGEMENT SOFTWARE?

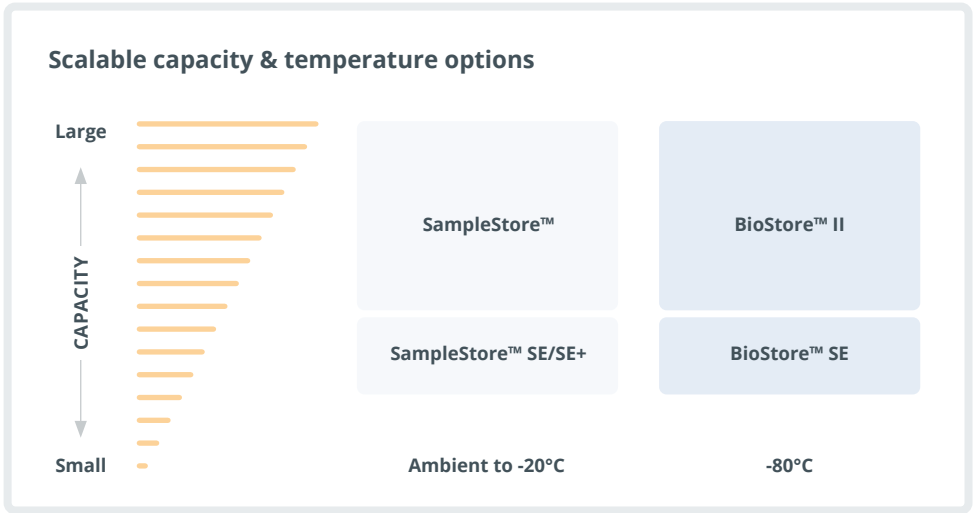
Titian's Automated Stores (AMS) application forms part of Titian's overall Mosaic sample management software suite. It provides a seamless automated link between Azenta's automated stores and Mosaic's sample tracking, order processing and audit trail. The integration ensures:

- You always know where your samples are because Mosaic's AMS application constantly monitors each store for activity, which means items will not be added or removed without Mosaic knowing about it
- You have a complete history of each sample because the sample records inside each store, such as freeze-thaw cycles, are matched with your audit trail of events outside the store
- You only need to learn one interface to manage and order from a wide range of automated stores, from large to small
- An order for samples can be submitted remotely by a scientist, and this request can be automatically processed (for example, run overnight) ready for when the scientist is next in the lab
- For particularly large orders, you can opt to schedule the whole order even if not all the samples are currently in the store. Then, when the samples are back, the store will automatically pick your order
- You can free up space in a store by compressing partly filled racks of samples, in addition to storing and retrieving samples as needed
- You can search for samples by specific criteria, such as small molecule batch or cell line passage number, rather than having to use the store ID
- Error recovery is seamless thanks to exhaustive testing and, in most cases, resolved with minimal user input
- You can receive email notifications remotely to help you recover quickly from issues like misread barcodes, failed picks, or missing labware
- You can investigate the cause of any errors through the detailed log of Mosaic's audit trail



COMPATIBILITY WITH AZENTA LIFE SCIENCES AUTOMATED STORES

Azenta Life Sciences provides automated sample storage solutions which offer scalable capacity, throughputs and storage temperature options to suit your needs. These include the SampleStore™, BioStore™ and SE/SE+ automated storage systems.



The Mosaic AMS application integrates with and drives the Azenta automated product range, as well as legacy stores.



SAMPLESTORE™ FOR COMPOUND MANAGEMENT

The Azenta Life Sciences SampleStore™ is scalable for sample storage capacity and throughput. Azenta Sample Management experts will design the store to meet the requirements of your workflow also considering the growth of the sample collection and future processing needs.

The SampleStore™ range offers:

- Single / dual tray conveyors, which enhance order processing throughput
- Single / dual shuttle robotics, which make it possible to achieve a 2x throughput increase if the configuration also includes multiple tube selectors
- Up to 16 picking stations, which provides the flexibility to increase throughput and/or labware types
- Acoustic workflow compatibility, which will pick and place three tubes at the same time for increased throughput and has been developed alongside the AcoustiX™ sample tube
- Automation Interface Module (AIM) for downstream processing, which delivers samples on a 6 position SBS-format rack tray compatible with tubes, vials or plates in 96, 384 and 1536 plate formats
- 3 / 4-lane selectors to minimise automation idle times. These allow a return order to be reformatted back into high density storage trays at the same time as cherry picking an order for output on the same picker



STRATA™ STORE CONTROLLER SOFTWARE

The Azenta Strata™ software is the high-performance engine that drives the sample management process in Azenta Life Sciences SampleStore™, BioStore™ and SE automated storage systems. Strata makes automated storage easy and convenient to use: no special engineering expertise is required to operate the system. Strata's reliability and flexibility ensure that your samples will be efficiently processed and securely protected.

The simplified user interface is easily configured for day-to-day operation, plus greater detail is available for "super users" via drill-down and advanced screens. The software simplifies integration with corporate IT systems, LIMS that support web services – such as Titian's Mosaic – and other technologies. It ensures reliable performance via intelligent diagnostics and error recovery.

The Strata™ store controller software provides sample security, high performance and reliability, an easy to use interface, remote access and an automation interface.

AZENTA LIFE SCIENCES INTEGRATION WITH TITIAN'S MOSAIC SOFTWARE

Azenta offers flexible LIMS integration options such as web services, database and file-based integration. For integration with Titian:

- Web services is the preferred Mosaic AMS
- Half of Azenta users integrate with Titian's Mosaic software, with more in discussions
- Azenta Life Sciences (now Azenta) has been partnering with Titian Software on integrations for over 15 years
- Azenta and Titian can provide a joint plan for sample migration to a new Azenta store, ensuring that all sample data is maintained
- It is possible to verify sample identity on entry to a Azenta store using the joint SampleMap Application Programming Interface (API)



SUPPORTED OPERATIONS FOR AUTOMATED STORAGE

Mosaic's AMS application provides a number of different processes to help users. These include:

- Storing or placing items
- Retrieving or picking samples
- Compressing racks
- Sample jobs for stores with integrated liquid handling
- Providing full sample information
- Sample search
- Error handling
- Email notifications
- Error investigation

Storing or Placing Labware Items

Operators simply store samples in tubes, racks or plates using the store's own software interface. Mosaic's AMS application will read the Azenta store's database and automatically update in real time the Mosaic database to record that these samples are now held by that store. No additional manual processing or updates are required.

Retrieving or Picking Labware Items

Mosaic's AMS application supports a series of operations to make order processing easier for operators.

Operators can pick samples in response to specific order requirements. Operators can also define the layout by which tubes will be placed into delivery racks. The operator selects the order(s) to run from Mosaic, and defines a layout and priority for the job, if wanted.



ORDERS (1)

Order ▾	Order Type	Next Operations	Priority	Pick in sequence ▾	Comment	Required By	Labware Items	Item Type
190/199 [ST-SP D/S] From Solutions in Tubes transfer to Plates for Delivery (by Substance)	[All] ▾	From Solution Tubes (by Substance)	Cherry Pick	Normal	<input type="checkbox"/>	09/04/2020	2	2D Mini Tube (1.4 mL)

Create Pick Job ▾

Refresh

Number Of Items	*	2 / 2
Layout	*	All 96 (Col) ▾
Priority	*	Normal ▾
Required by	*	09/04/2020
Comment		

Create Pick Job

Cancel

Defining a layout means the Azenta store is instructed to pick in the correct 96 rack layout to be compatible with the downstream process required. For instance, the final plate may need columns A and B free to have controls added by the assayist or in a subsequent Mosaic workflow process. Mosaic will know that the tubes need to be picked into a rack with only 80 tubes, leaving column A empty so the subsequent replication into a 384-well plate with 96 block head results in the correct plate layout.

Mosaic's AMS application then creates the pick order for the store and monitors progress, including updating inventory locations in real time, as the labware leaves the store:



Pick Job 5 - Azenta Store

DETAILS

Store	\Home\Bld_01\Lab_01\Brooks Store		
Job Type	Pick	Total Job Items	2
Orders	190/199 [ST-SP D/S] From Solutions in Tubes transfer to Plates for Delivery (by Substance)		
Priority	Normal	Required By	09/04/2020
Comment			
Failure Text			
Status	New	Pending Items	2
Complete Items	0	Failed Items	0

 Edit Priority ▾


 Pause ▾

 Resume ▾

 Cancel ▾

JOB ITEMS (2)

Barcode ^	Order	Status	Failure Text
	[All] ▾	[All] ▾	
TJS2703173	199	Pending	
TJS2703174	199	Pending	

 View Store

Alternatively, operators can request samples are picked to meet self-service needs, simply by building a list of items that require picking and submitting it to the store. For example, to fulfill a particular search request.

Mosaic's AMS application automatically allocates pick jobs according to order priority. This priority may have been set by the requesting scientist at the time of placing the sample order, or it can be set by the store's operator.

Compressing Labware Racks

Mosaic's AMS application can request automated stores to compress partly-filled racks of labware when required (this is not relevant for plate only or tube only stores).



Sample Jobs

Mosaic's AMS application also supports automated stores which have an integral liquid handler – such as Azenta Strata with additional Automation Interface Module - making it easy for you to request that specific liquid handling operations are performed on your order for samples.

Sample Information

Mosaic's AMS application connects the Mosaic inventory to the Azenta store's records so sample information can be accessed and the sample's history can be reviewed:

SAMPLE

Substance Type:	Basic
Name:	Set29-Plate25-Well43
SubstanceId:	280943
CmpIdDivBy20:	14047-3
CmpIdDivBy30:	9364
Test_Key:	
Amount:	800 µL
Available Amount:	775 µL
Concentration:	10 mM
Solvent:	100.0 % DMSO
Total Thaw Count:	1
Filled Date:	3/3/2020 10:52:46 AM
Ignore:	No
Initial Amount:	800 µL

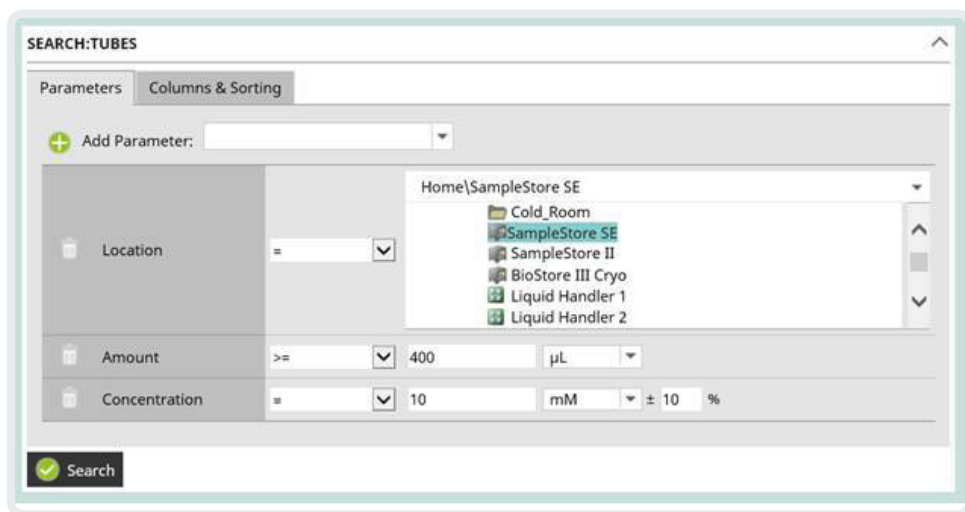
ORDERS

	Order Id	Next Step
<input type="checkbox"/>	3229	Cherry Pick

Complete Work

Sample Search

Using Mosaic's AMS application gives operators access to Mosaic's powerful Search tools, so that samples can be traced by specific criteria instead of just sample ID. This allows scientists and operators to conduct and save searches which could be based on a range of criteria such as concentration, small molecule batch, cell line passage number, labware type, number of freeze/thaw cycles or expiry dates.



The screenshot displays the 'SEARCH:TUBES' application window. It features two tabs: 'Parameters' and 'Columns & Sorting'. The 'Parameters' tab is active, showing a search form with the following fields:

- Location:** A dropdown menu with a list of locations: Cold_Room, SampleStore SE (highlighted), SampleStore II, BioStore III Cryo, Liquid Handler 1, and Liquid Handler 2.
- Amount:** A numeric field set to 400, with a unit dropdown set to μL .
- Concentration:** A numeric field set to 10, with a unit dropdown set to mM and a tolerance dropdown set to $\pm 10\%$.

At the bottom left of the form is a green checkmark icon and a 'Search' button.

Error Handling

Integrating your Azenta store using Mosaic's AMS application not only integrates it smoothly into your sample management workflow, but also improves robustness as the application is very extensively tested to handle a wide range of errors. It also aids the rapid diagnosis and resolution of any support issues.

Errors are treated as two types: a blocking error, that requires operator action before orders can proceed; or a non-blocking error that may be parked to allow other processes to continue until the error can be resolved. The most common errors usually stem from human error and involve unknown labware in a location.



Email Notifications

If an error or store alert occurs, it can be automatically emailed out to a specific list via the AMS application. This aids timely response and helps to diagnose and resolve support issues.

Mosaic Server: ITSUSRAWSP04329

Warning:

Discrepancy between labware item in Mosaic Inventory and data returned from the store

The following labware items have been moved from 2700753081 (Id:9450773) (TubeRack) to the bench:

TubeBottle 0046472677 (Id:2517752) (1,5,1)
TubeBottle 0046472708 (Id:2517721) (1,6,1)
TubeBottle 0051753723 (Id:2485082) (1,8,1)
TubeBottle 0051752704 (Id:2485062) (2,1,1)
TubeBottle 5900098143 (Id:4408623) (2,2,1)
TubeBottle 0046508711 (Id:4253297) (2,4,1)
TubeBottle 2891329560 (Id:7729843) (2,5,1)

This message has been sent because some unusual situation occurred.
AutomatedStore handled the problem and no user action is required.

Investigating Errors

In the event of a store error, the integration with Mosaic's AMS application makes diagnosing the problem very easy as all the store notifications are stored in Mosaic's log and it is simple to backtrack and pinpoint the cause.



SUMMARY

Titian's AMS application seamlessly integrates Mosaic inventory software with your Azenta automated store(s). Mosaic will monitor store activity and automatically update its database as inventory known to Mosaic is stored or retrieved, ensuring your audit trail remains up to date.

By using Mosaic's AMS application, scientists and sample management operators can share one interface to manage multiple automated stores efficiently. Assay samples can be picked from any store, urgent orders are automatically prioritized, and errors minimised while error handling is streamlined.

This seamless integration between Mosaic and a variety of Azenta automated stores makes the best use of your storage capacity, optimises processing, reduces energy consumption, improves error handling and recovery and provides a full audit trail for your samples.

An additional benefit is that Titian works in partnership with automated store vendors, such as Azenta Life Sciences, to continually evolve the AMS application, so it is responsive to customer requirements and the development of new store types and software.

AUTHORS

TIM STROUD: After 15 years as a scientist at Pfizer, Tim Stroud moved to MedImmune for 3 years to specialise in managing laboratory automation. He joined Titian Software in 2014 and is now a Sales and Application Consultant.

DEAN MONTANO: Dean has worked in product management roles at Braemac Ltd and Promethean, as well as product marketing roles at NXP Semiconductors and Cooper Bussman. He joined Azenta Life Sciences (formerly Brooks) in 2017 as a Senior Product Manager with responsibility for automated sample storage.

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ABOUT TITIAN SOFTWARE

Titian is the industry leader in providing sample management software for the Life Sciences. Using our Mosaic software, our customers see significant benefits in terms of throughput, response times, error rate reduction, sample conservation and cost savings due to markedly reducing the labour associated with managing sample collections. We also use our experience of integrating laboratory instrumentation and robotics into our systems to ensure that our clients make best use of their investment in research and development technologies.

At Titian, our development efforts never stop as we continue to advance Mosaic toward higher levels of efficiency and practicality for the user. The ongoing collaborative relationship between Titian and hardware vendors continues to ensure that new applications are made available on a timely basis to fulfill our customer's research goals. We pride ourselves on taking into account customer feedback for all of our Mosaic applications to drive our product to be the best it can be. It's all part of Titian's commitment to providing innovative solutions that make life easier for sample management professionals.



ABOUT AZENTA LIFE SCIENCES

Azenta Life Sciences (formerly Brooks) offers a comprehensive and innovative portfolio of sample management solutions, enabling researchers worldwide to accelerate innovation and improve patient health.

We believe that a quality sample, supported by smarter sample management solutions, is the cornerstone for the generation of robust, reproducible and quantifiable data - which is why Azenta Life Sciences is all about the sample.

For over 20 years, Azenta Life Sciences has been the global leader in high density automated sample storage. This means that:

- It is the preferred storage partner of choice, supporting 9 out of 10 top biopharma companies
- Its stores offer a range of flexible storage temperatures from room temperature to -190°C
- Its fully configurable modules allow a wide range of applications, throughput and labware
- It offers adaptable and versatile storage automation from single labware type to multiple formats: tubes, vials, plates and REMP microtubes





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info@titian.co.uk

www.titian.co.uk

UK Tel:

+44 20 7367 6869

USA Tel:

+1 508 366 2234