



Integrating an Automated Store to your Mosaic Software using Titian's Automated Stores (AMS) Application

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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 log each sample into and out of storage, process samples rapidly and improve sample integrity by keeping samples in a stable temperature-controlled environment, often under an inert gas. 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 repeatedly be brought back down to the correct temperature.

BENEFITS OF INTEGRATING AUTOMATED STORES WITH YOUR SAMPLE MANAGEMENT

Titian's Automated Stores (AMS) application forms part of Titian's overall Mosaic sample management software suite. It provides a seamless automated link between automated stores from a wide variety of vendors 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

COMPATIBLE AUTOMATED STORES

The Mosaic AMS application integrates with and drives a wide variety of automated stores, from large to small, from market leading manufacturers such as:

- Azenta Life Sciences (formerly Brooks)
- SPT Labtech
- TAP
- Nexus
- Matrical
- Hamilton





SUPPORTED OPERATIONS

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 store's database or log files 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.

Requests to store samples can also be placed via the Mosaic interface, if 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		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 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

If multiple stores share one input/output buffer, then Mosaic's AMS application treats them as one extended store and a pick job for samples can consolidate samples from across all of these stores directly into one set of racks for an assay.

Alternatively, operators can request samples are picked on an ad hoc basis 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, even if this is not a function the automated store supports directly (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 Azentra's Strata with additional Automation Interface Module or SPT Labtech's comPILER, amongst others –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 automated 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

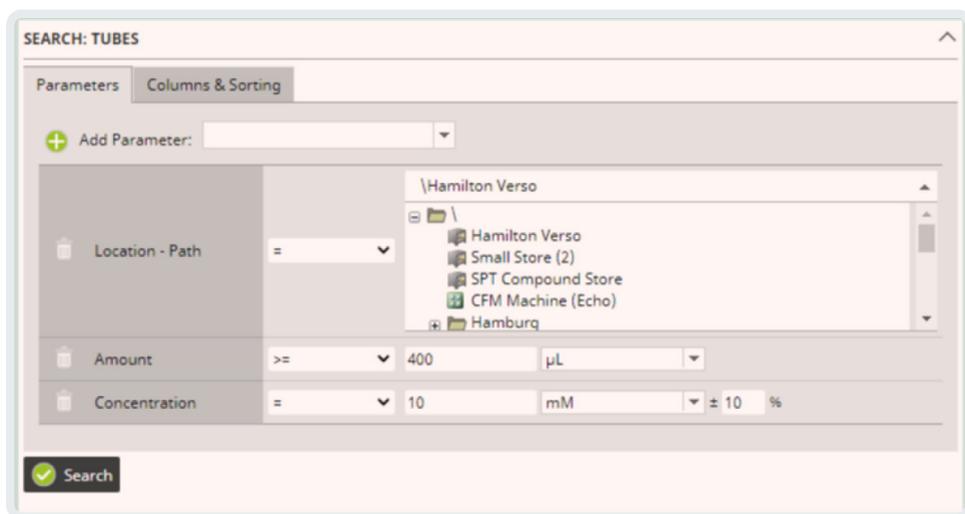
	Order Id	Next Step
<input type="checkbox"/>	3229	Cherry Pick

 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.



Error Handling

Integrating your automated 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 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 wide variety of 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 to continually evolve the AMS application, so it is responsive to customer requirements and the development of new store types and software.

AUTHOR

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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.

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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.





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