

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

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v2.1.

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. Being able to integrate your chosen store easily and comprehensively into your workflow management provides multiple benefits and efficiencies.

BENEFITS OF USING AN AUTOMATED STORE

Automated stores, such as SPT Labtech's comPOUND[®], comPACT[®] or arctic[®], check 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 SPT Labtech automated stores and Mosaic's sample tracking, order processing and audit trail. The integration ensures:

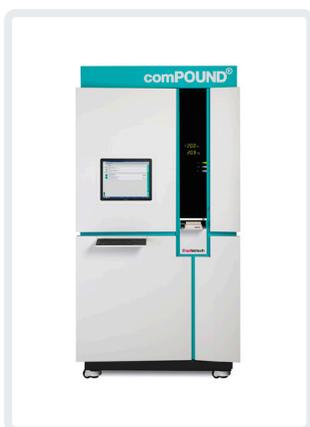
- You always know where your samples are. Mosaic's AMS application constantly monitors each store for activity, so that Mosaic's inventory is automatically updated when any items are added or removed



- You have a complete history of each sample because the sample records inside each store, such as freeze-thaw cycles, are added into Mosaic's audit trail of events outside the store
- Scientists and operators only need to learn one interface to manage and order from a wide range of automated stores, from large to small
- A sample order can be submitted remotely by a scientist, ready for when the scientist is next in the lab
- 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 Titian's exhaustive testing and most errors are 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, including SPT Labtech's comPOUND, comPACT and arctic, along with additions to the stores including comSTACKER and lab2lab connect.



SUPPORTED OPERATIONS

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

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

Storing or Placing Labware

Operators simply store samples in tube racks using the store's own software interface. Mosaic's AMS application will read the SPT Labtech store's log files and automatically update the Mosaic database in real time 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 using the Mosaic interface, if required.

Retrieving or Picking Labware

Mosaic's AMS application makes order processing easier for operators:

- Operators can pick samples in response to specific order requirements.
- Operators can also define a layout for tubes to be placed into delivery racks to facilitate a downstream process, e.g. to leave columns for controls to be added to a plate.

To do this 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
190/199 [ST-SP D/S] From Solutions in Tubes transfer to Plates for Delivery (by Substance)	From Solution Tubes (by Substance)	Cherry Pick	Normal	<input type="checkbox"/>		09/04/2020	2	2D M 4 ml

Number Of Items: + 2 / 2
 Layout: + All 96 (Col)
 Priority: + Normal
 Required by: + 09/04/2020

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 - SPT Store

DETAILS

Store	\Home\Bld_01\Lab_01\SPT 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

JOB ITEMS (2)

Barcode	Order	Status	Failure Text
TJ52703173	199	Pending	
TJ52703174	199	Pending	

If multiple stores share one input/output buffer, then Mosaic's AMS application treats them as one extended store and samples from all the stores can be consolidated 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 submitting a list of items 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 be set by the requesting scientist when placing the sample order, or by the store's operator.



Sample Jobs

Mosaic's AMS application also supports automated stores which have an an integral liquid handler such as SPT Labtech's compILER. This further automates the specific liquid handling operations which can be performed on your sample order without an operator needing to move samples to other workstations.

Sample Information

Mosaic's AMS application connects the Mosaic inventory to the SPT Labtech 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

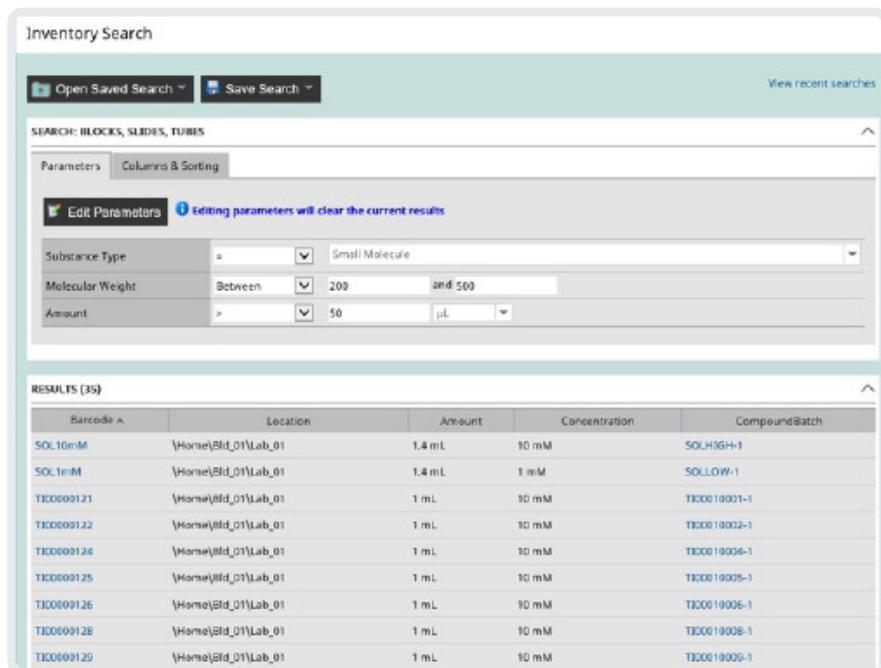
ORDERS	
Order Id	Next Step
<input type="checkbox"/> 3229	Cherry Pick

 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 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.



Inventory Search

Open Saved Search Save Search View recent searches

SEARCH: BLOCKS, SLIDES, TUBES

Parameters Columns & Sorting

Edit Parameters Editing parameters will clear the current results

Substance Type: a Small Molecule

Molecular Weight: Between 200 and 500

Amount: > 50 µL

RESULTS (35)

Barcode	Location	Amount	Concentration	Compound/Batch
SOL10mM	\\Home\Bld_01\Lab_01	1.4 mL	10 mM	SOLH9G+1
SOL1mM	\\Home\Bld_01\Lab_01	1.4 mL	1 mM	SOLLOW+1
TIC0000121	\\Home\Bld_01\Lab_01	1 mL	10 mM	TIC0010001-1
TIC0000122	\\Home\Bld_01\Lab_01	1 mL	10 mM	TIC0010002-1
TIC0000124	\\Home\Bld_01\Lab_01	1 mL	10 mM	TIC0010006-1
TIC0000125	\\Home\Bld_01\Lab_01	1 mL	10 mM	TIC0010005-1
TIC0000126	\\Home\Bld_01\Lab_01	1 mL	10 mM	TIC0010006-1
TIC0000128	\\Home\Bld_01\Lab_01	1 mL	10 mM	TIC0010008-1
TIC0000129	\\Home\Bld_01\Lab_01	1 mL	10 mM	TIC0010009-1

Error Handling

Mosaic's AMS application improves store robustness as well as integrating stores smoothly into your automated workflow. The AMS 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 labware unknown to Mosaic 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 review them and pinpoint the cause.



SUMMARY

Titian's AMS application seamlessly integrates Mosaic inventory software with your SPT Labtech 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.

The benefits of using Titian's AMS application to seamlessly integrate automated stores with Mosaic software includes multiple efficiencies:

- Automatic inventory and audit trail updates, removing the burden from operators
- Operators and scientists only need one interface to manage multiple stores efficiently
- Assay samples can be automatically picked from any store
- Urgent orders are prioritized
- Errors are minimized, error handling is streamlined and error recovery is faster
- Storage capacity and processing is optimized
- A full audit trail combines sample history from inside and outside the store

An additional benefit is that Titian works in partnership with automated store vendors, such as SPT Labtech 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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