{ APP NOTE }

HAMILTON

titian

Integrating a Hamilton Storage Automated Store with your Mosaic Software using Titian's Automated Stores (AMS) Application

v2.1

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INTRODUCTION

Manual methods of storing and retrieving samples are slow, inefficient and prone to quality issues in comparison to automated ones. With that in mind, it is a natural step for companies to add automated storage systems to their sample management workflows 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 Hamilton Storage's Verso®, Verso Q-Series, and SAM HD, log each sample into and out of storage, process samples rapidly and improve sample integrity by keeping samples in a stable temperature-controlled environment. Because freezer doors do not have to be opened for prolonged periods of time, temperature fluctuations are virtually eliminated. This has the additional benefit of reducing energy consumption.

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 a variety of Hamilton Storage automated systems 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 user software interface to manage all Hamilton Storage automated stores, from large to small
- An order for samples can be submitted remotely. This request can be automatically processed, even after normal work hours, so it's ready and waiting for when you are next in the lab
- For particularly large pick jobs, 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 search for samples by specific criteria, such as small molecule batch or cell line passage number, rather than having to use the sample 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
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COMPATIBLE AUTOMATED STORES

The Mosaic AMS application integrates with and drives a wide variety of large to small automated stores including Hamilton Storages:

- Verso
- Verso Q-Series
- SAM HD
- BiOS

SUPPORTED OPERATIONS

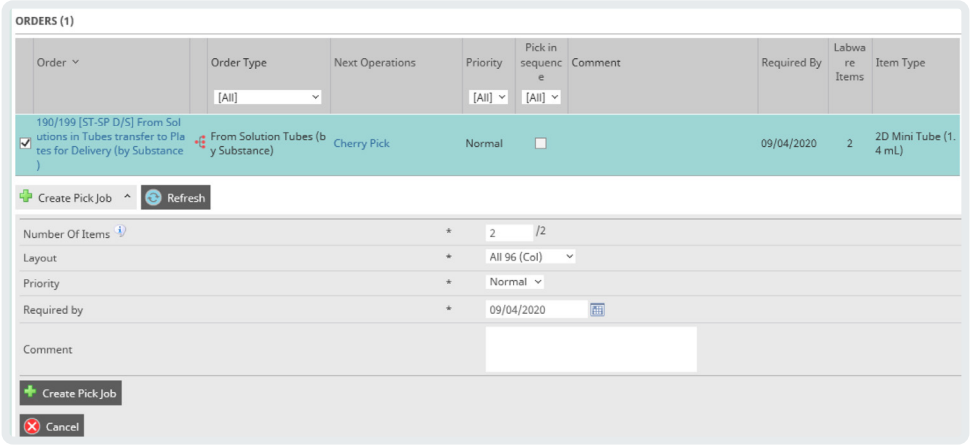
- Retrieving or picking samples
- Compressing partly filled racks to maximise storage space
- Providing full sample information
- Sample search
- Error handling
- Email notifications
- Error investigation

Storing or Placing Labware Items

Operators are able to use the system's own software interface to simply and safely store samples in tubes, vials, or swallow or deepwell microplates. Mosaic's AMS application will read the Hamilton Storage platform'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.

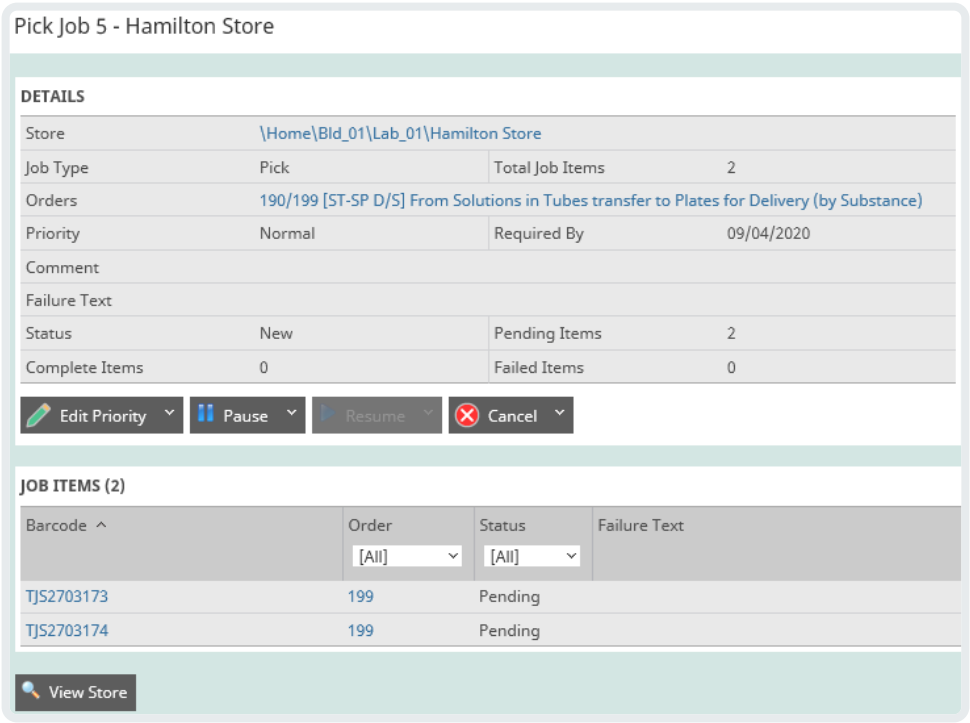
Retrieving or Picking Labware Items

Mosaic's AMS application supports a series of operations to make order processing easier for users. 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 user selects the order(s) to run from Mosaic, and defines a layout and priority for the job, if wanted.



Defining a layout means the Hamilton Storage system is instructed to pick in the correct 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:



Users can request that 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 fulfil 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 racks of labware that are only partly filled into fewer fully filled racks, which are more space-efficient to store (this is not relevant for plate- or tube-only stores).

Sample Information

Mosaic's AMS application connects the Mosaic inventory to the Hamilton Storage platform'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

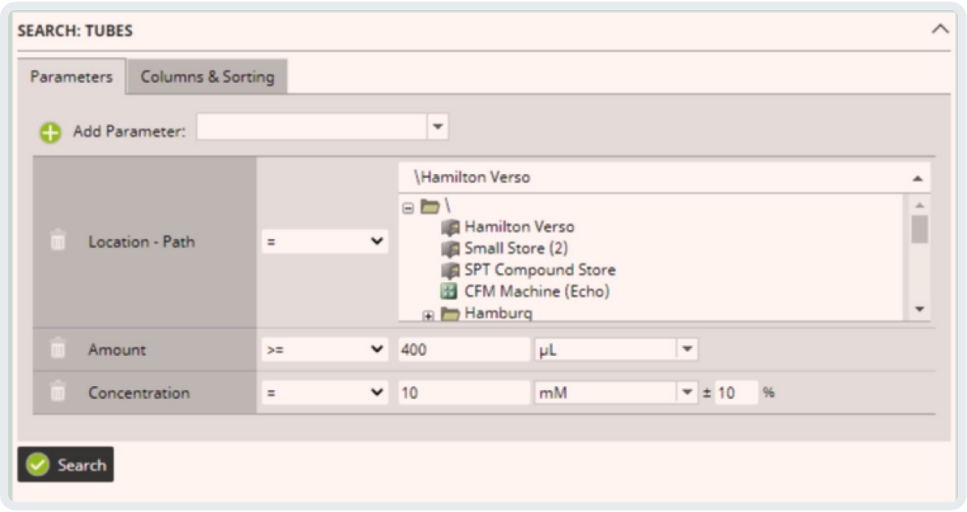
ORDERS

	Order Id	Next Step
☐	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 users to conduct and save searches that 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 Hamilton Storage system using Mosaic's AMS application not only integrates it smoothly into your sample management workflow, but also improves robustness as the application is 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 paused 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.
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Investigating Errors

In the event of a store error, the integration with Mosaic's AMS application makes diagnosing the problem exceptionally easy. All system 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 Hamilton Storage automated store(s). Mosaic will monitor system 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 a single user interface to manage multiple automated stores efficiently. Assay samples can be picked from any store, urgent orders are automatically prioritized, and errors minimized, while error handling is streamlined.

This seamless integration between Mosaic and a variety of Hamilton Storage automated platforms makes the best use of your storage capacity, optimizes 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 manufacturers, such as Hamilton Storage, to continually evolve the AMS application, so it is responsive to customer requirements and the development of new store types and software.

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 fulfil 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 HAMILTON STORAGE

Hamilton Storage, an affiliate entity of Hamilton Company, is a global leader in the design and manufacturing of automated storage systems for biological and compound samples. By safeguarding the integrity of even the most precious samples, our solutions and expert knowledge empower researchers to reach new heights of laboratory efficiency while remaining focused on life science research. Our sample storage solutions, benchtop devices, and consumables are designed for sample integrity, flexibility, and reliability for life science applications. Hamilton Storage continues to develop innovative technologies to fit market needs and be known as the sample care company for the life science industry.

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