

comPOUND meets AcoustiX™ tube –how proven technology adapts to new tunes!

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introduction

In 2018, a collaboration between AstraZeneca, Brooks Life Sciences, Labcyte and Titian resulted in the release of a new AcoustiX™ tube (a Labcyte® Echo® Qualified Consumable). The associated workflow was designed to streamline the compound management process.

Whilst there are several advantages to this approach, its adoption requires a significant capital investment due to the fact that most legacy sample tube storage and processing equipment is not AcoustiX™ tube compatible.

SPT Labtech have supplied solutions for compound® management for almost 2 decades, with a reputation for highly robust and reliable systems centred around pneumatic sample handling and transport.

SPT Labtech's comPOUND storage system

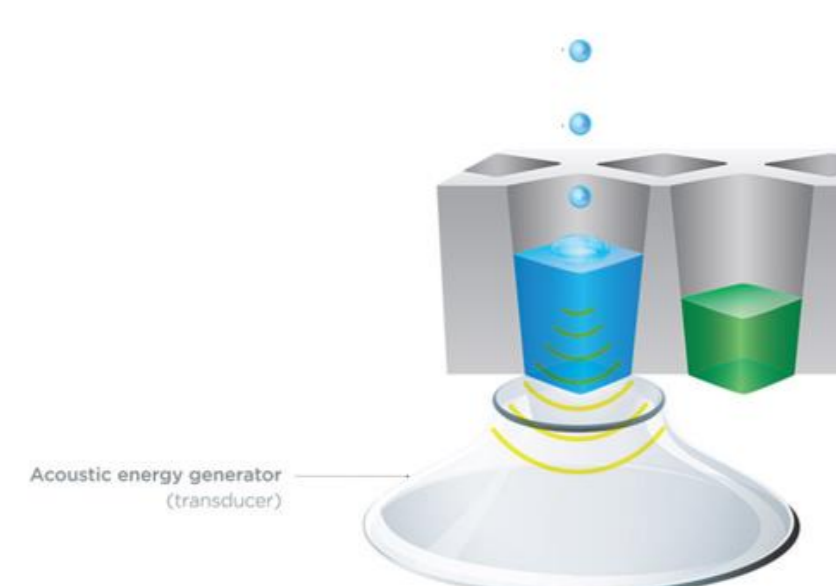


The new AcoustiX™ tube presented SPT Labtech with several technical challenges to overcome in order to provide compatibility with their comPOUND storage solution.

This poster outlines these challenges and their progress to date developing a working solution.

1. challenging features

Acoustic dispensing requires the direct coupling of a transducer with the bottom of the tube through a liquid medium. In order for this to work, a traditional 2D barcode in the centre of the tube bottom is not possible because it would interfere with the integrity of the transducer coupling.



Acoustic transducer in contact with well/tube

A rectangular base enables a standard 2D barcode to be split in half and duplicated to give 4 parts in total, providing a repeat code and a greater ability to read damaged codes.

The base of an AcoustiX™ tube and its 4 section split barcode



Any device utilising this tube needs to be able to successfully image the base of the tube and correctly re-construct the complete code from the 2 parts.



AcoustiX™ rack top view (left), bottom view (right)

Tubes are pneumatically transported in and out of the SPT Labtech comPOUND store, with barcodes read during transport. Initially there were concerns that the split barcode would be difficult to read correctly and reliably, however, with some small adjustments to the barcode reader, reliable imaging is achievable.

The comPOUND software team were able to address the split barcode issues and reconstruct the data, as well as utilising the redundant code, to ensure a robust approach to barcode scanning even when part of the barcode is damaged.

2. retrieving tubes to the AcoustiX™ rack

Until now, every 2D barcoded tube on the market has featured a circular base and the rotational orientation of a tube was unimportant to robotic handling systems.



Rectangular base of AcoustiX™ tube (left) vs common circular base tubes (right)

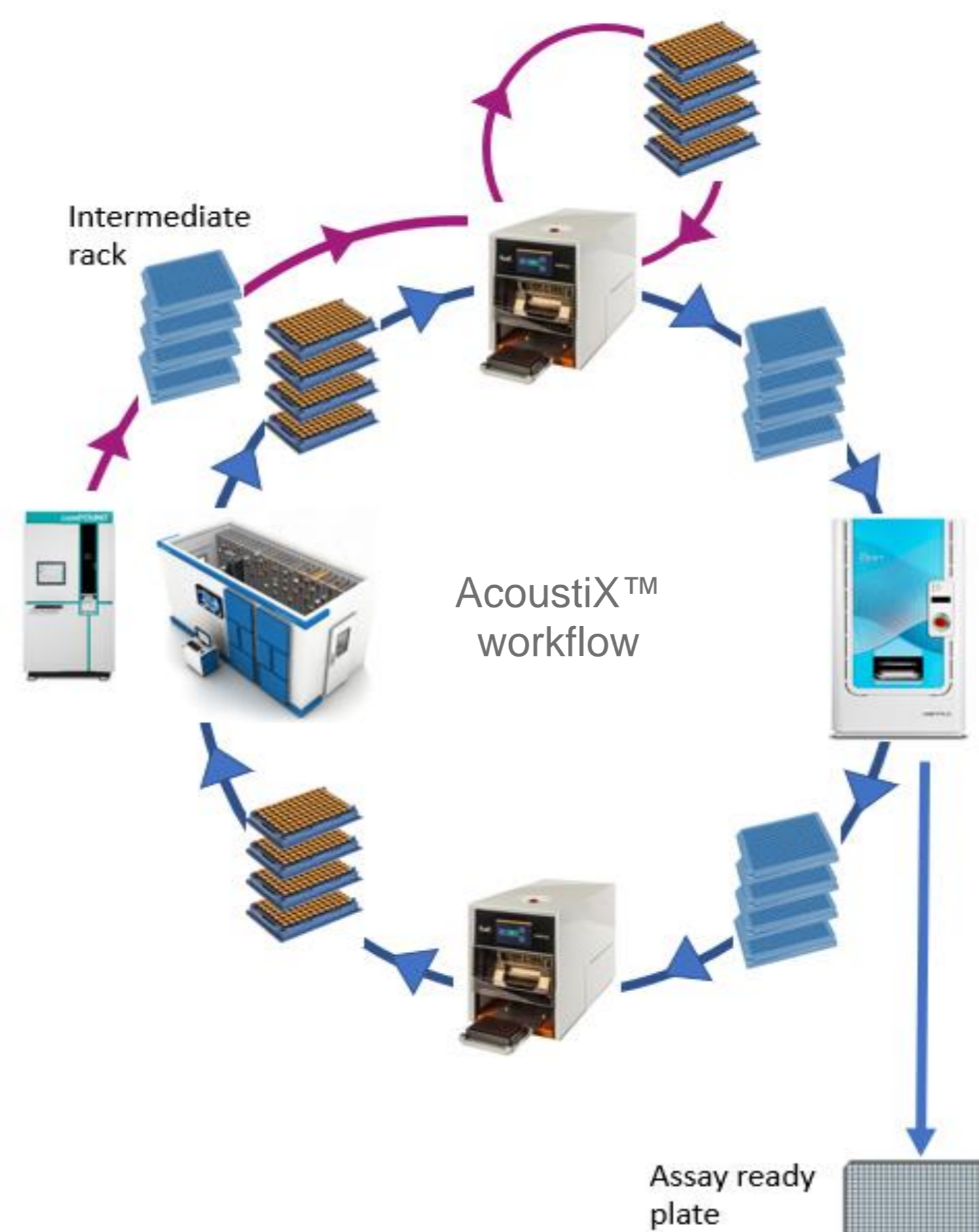
With the introduction of a rectangular tube, a critical feature of acoustic technology to introduce constructive interference and speed up repeated droplet dispensing (reps), robotic handlers now need to correctly rotate the tube accurately to place it into a rack in one of two possible orientations, 180 degrees apart. Failure to do this correctly will result in the tube 'crashing' into the top of the rack.

Tubes placed incorrectly into a rack sit high and cannot continue through the process



comPOUND's pneumatic system is not able to rotate tubes. Adding tube handling robotics to circumvent the issue would add complexity and impact reliability compromising its currently proven approach.

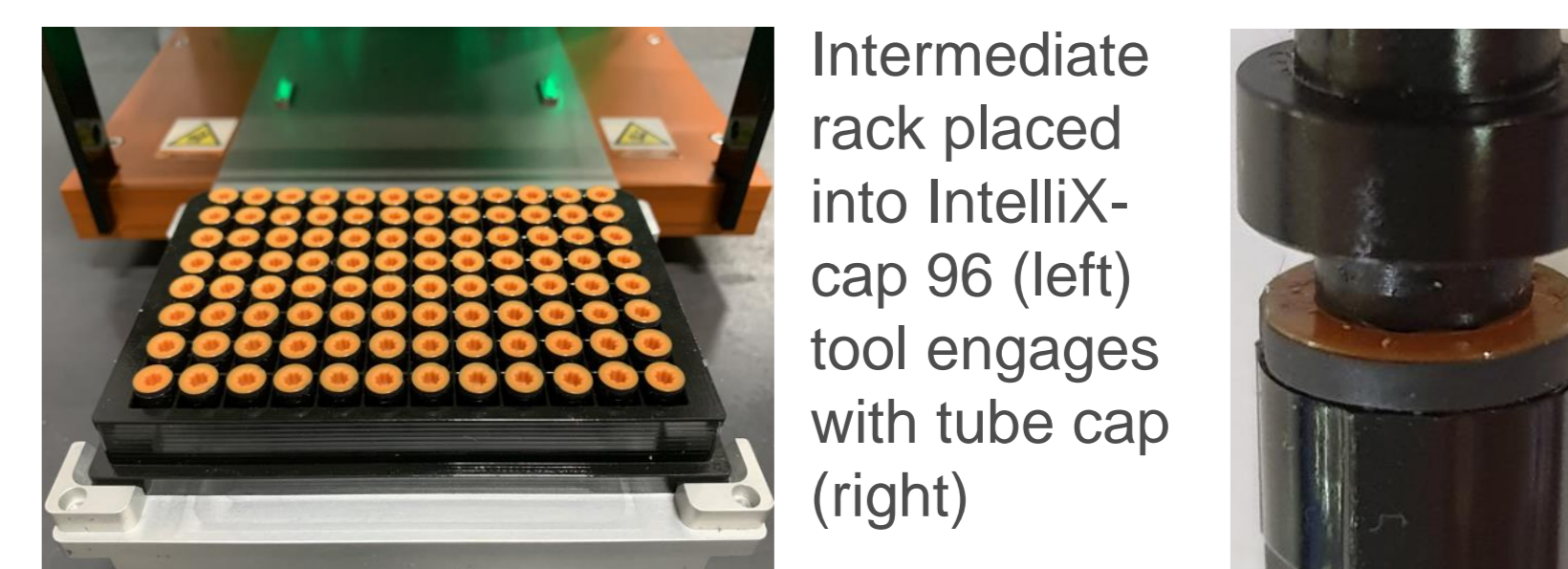
Post retrieval tubes, however, need to be decapped which offers a solution to the problem. Working in collaboration with Brooks Life Sciences, an approach using an intermediate reusable rack was investigated. This utilises the IntelliXcap 96 to transfer AcoustiX™ tubes from an intermediate rack to the AcoustiX™ rack, requiring only a minor deviation from the original workflow.



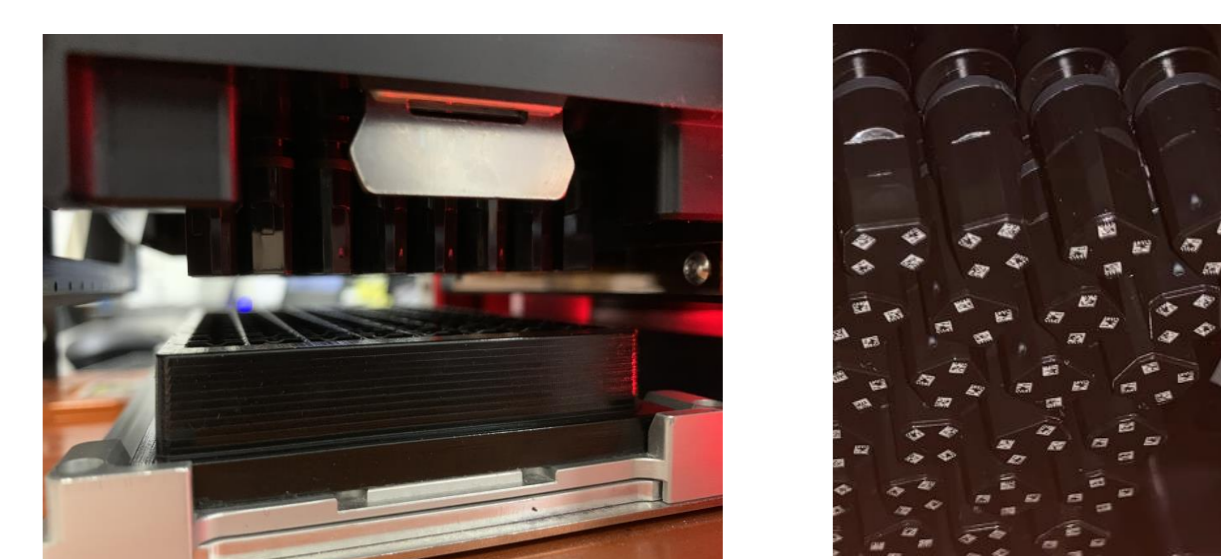
The pneumatic transport of AcoustiX™ tubes in comPOUND, can be closely controlled and iterations of testing have continued to improve the reliability and speed of tube retrieval to the intermediate rack. With further fine tuning it is anticipated that reliability and throughput capabilities will match regular tube performance.

3. transfer to AcoustiX™ rack

Following retrieval from comPOUND, the intermediate rack is placed into the IntelliXcap 96 and the decapper tool lowered to engage with the caps. Retracting the tools results in the tubes being picked up.



Intermediate rack placed into IntelliXcap 96 (left) tool engages with tube cap (right)



96 tubes lifted clear of intermediate rack (left) Underside of AcoustiX™ tubes held in capper (right)

The intermediate rack is swapped for an AcoustiX™ rack. Tubes are lowered slowly, rotating on top of the rack until the correct orientation is achieved and they locate correctly. Decapper tools are individually sprung which aids the process. With all the tubes in place, the capper pushes down to ensure tubes are locked in the rack (it does this as standard in the normal AcoustiX™ workflow), then decaps tubes. At this point, the original workflow resumes.

4. storing tubes

AcoustiX™ tubes can be transferred back into comPOUND directly from the AcoustiX™ rack, the caveat being that they need releasing from the lock position. Our future intention is to develop a simple tool that could be used manually or in an automated workcell to perform this task.

5. next steps

- Continued high throughput testing to ensure reliable operation
- High density storage tests to see if comPOUND's capacity can be increased from 100,000 to 200,000 AcoustiX™ tubes per store
- Test the intermediate rack approach in fully automated approaches e.g. Labcyte access.

conclusion

SPT Labtech expect to release a solution for AcoustiX™ tubes within the next 3-6 months.

This solution will offer a lower entry point in terms of cost and storage capacity and the potential to utilise the wider benefits of the comPOUND product range, including the ability to interlink comPOUND units to expand capacity and the remote delivery of samples.

Remote delivery of standard sample tubes directly from storage into workcells is a reality and should soon be possible for AcoustiX™ tubes.