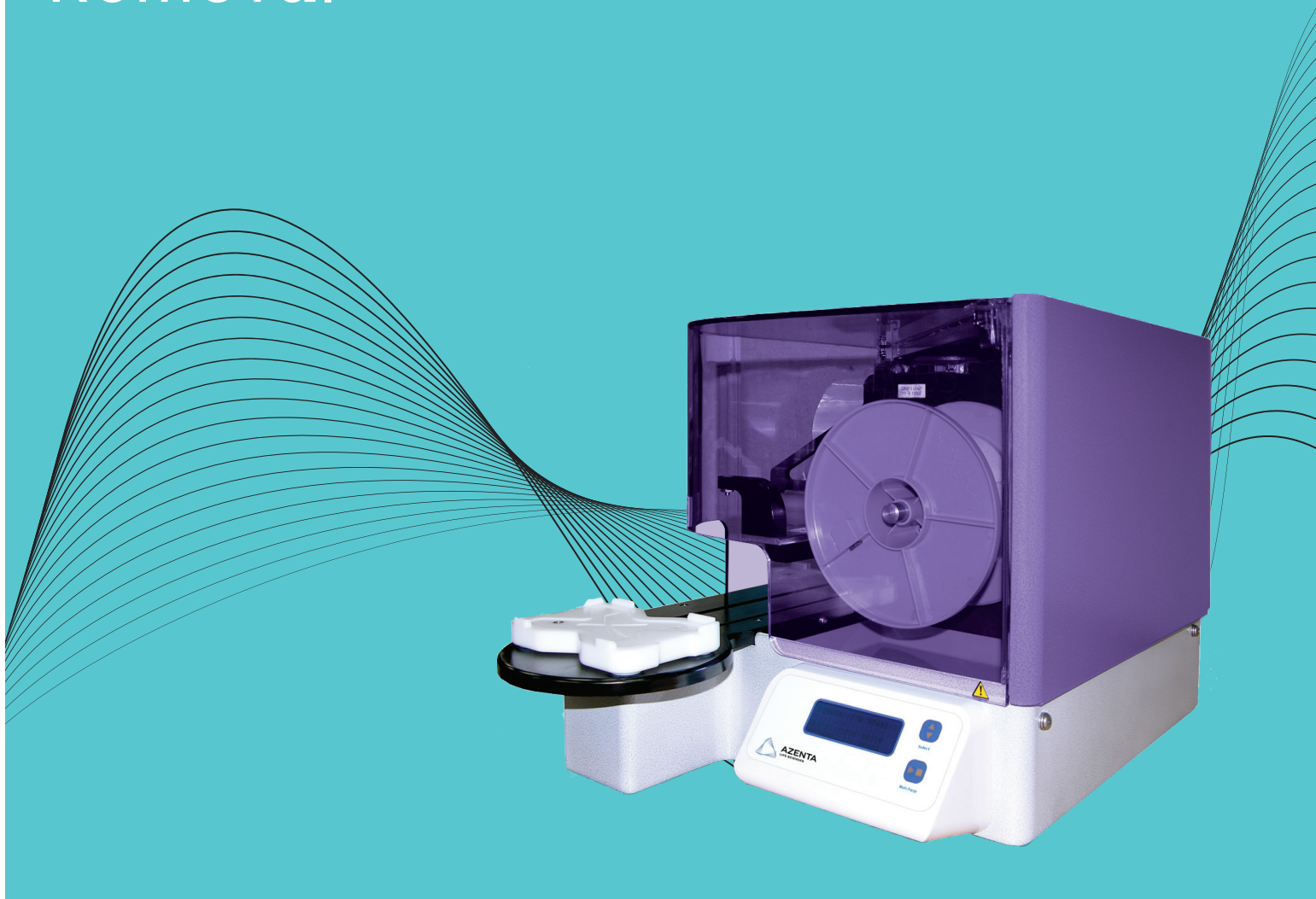


WHITE PAPER

Breaking The Bottleneck: Boosting Lab Performance With Automated Plate Seal Removal



Introduction

The hands-on removal of a seal from a sample plate is a routine, seemingly undemanding laboratory task.

However, removing and/or replacing dozens or hundreds of seals at a time on a repetitive basis can represent a formidable challenge. It's a challenge facing managers in many high-throughput screening (HTS) and high-content screening (HCS) facilities at pharmaceutical, biotechnology, and academic laboratories worldwide.

Even where a lab invests in automated liquid handlers or storage robotics, this step — unsealing or resealing plates for sample access — often still relies on mistake-prone, tedious, and time consuming manual labor. Or it may depend on traditional mechanical methods, which present their own difficulties.

Fortunately, adhesive-based desealing technology is revolutionizing this lab function. For the first time, automated plate seal removal systems bring the multiple performance advantages of full automation to sample access on microplates and deepwell plates.

This report considers the drawbacks of traditional methods, and expands on the benefits of automated seal removers.

The Trouble With Traditional Solutions

As laboratory productivity ramps up with increased automation, lab managers often find that sample access represents a critical but heretofore hidden process bottleneck.

Slow, wasteful workflow

Plates usually require some type of seal to prevent evaporation, which otherwise may alter sample concentrations and ruin repeatability.

But in many laboratories, manual desealing/resealing can consume hundreds of precious person-hours in just a few weeks of operation.

In any organization where high productivity is mission-critical, for instance, a competitive drug discovery operation; delays due to this bottleneck can mean serious setbacks for laboratory goals, or even for overall business plans. Additionally, manual seal removal often forces a misallocation of human resources, and expensive automation is not being utilized to its fullest extent. Technicians can't attend to more important projects; scientists' time is wasted, when they could be doing more practical scientific work.

Cross-well contamination

Users performing manual desealing report numerous difficulties. "You run into a lot of problems trying to use sticky seals while wearing gloves," one scientist says.

Heat-sealed plates are especially difficult to manipulate (heat can cause problematic condensation as well). Splashes can bring loss of sample material, contamination of adjacent samples, and perhaps hazardous exposure for the technician. Ripped seals that expose plate contents to the air are all too common. Additionally, seal/foil piercing devices present their own problems: they have a tendency to lift and catch plates, and they contact each succeeding sample with the same mechanism, increasing contamination potential.

Other problems

When desealing protocols are repeated for extended periods, plate handlers may report repetitive motion injuries. Boredom or fatigue can increase the incidence of mishandling or procedural errors. And plate or seal damage from technicians or seal piercers may raise handling and storage issues for the affected plates.

The Automation Advantage

Many labs are now moving from manual or partially automated means to fully automated plate seal removal systems. Some such systems use an air actuated gripper or a mechanical “finger” to pry seals away from plate surfaces. However, these devices can be prone to failures wherein they are unable to dislodge a seal or to get an initial grip on its leading edge.

To date, a nonmechanical, adhesive-based approach has established the most reliable performance record among automated seal removal solutions. Leading example: the Automated Plate Seal Remover from Azenta Life Sciences system. It runs each plate under a freshly exposed section on a roll of its patented De-sealing tape removal medium, peeling the seal away as it sticks to the tape. The device’s design enables it to hold the plate steadily and securely while removing even the most difficult-to-peel seal. Users testify that this technology provides fast, robust, contamination-free, high-throughput access to samples.

Improved workflow

This automated solution integrates well with varied workflows in a wide range of laboratories. For example, since its wide tape profile securely grips almost any surface configuration, this technology handles all SBS format plates as well as deepwell cell-culture plates, including low-base microplates, full-skirted PCR plates, and other deepwell models. It’s compatible with a variety of full-plate seals, including heat- and pressure-applied types.

It avoids the need for uncovered plates to spend hours waiting in stackers while evaporation spoils sample concentrations. And it eliminates lids — thus further ensuring sample integrity.

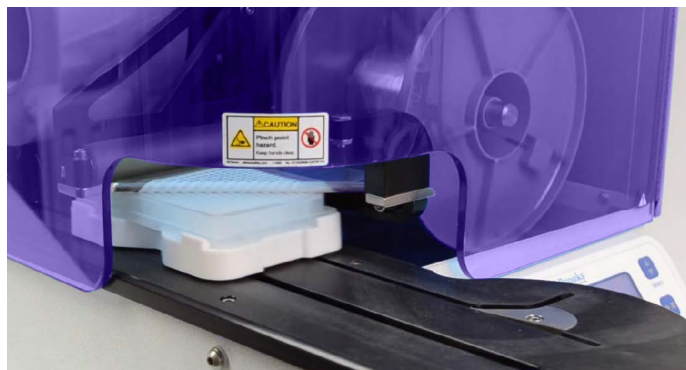
Above all, the new technology represents a marked improvement over traditional manual methods. One lab automation manager puts it this way: “In the past, when we had no automated handling of seals — it required an operator to sit there by the machine, sealing and unsealing. There was a lot of brainless time in manual handling that people had to do. The Automated Plate Seal Remover basically eliminated that for us. Completely.”

Pushing only one button to activate an entire automated run lets the technology eliminate any possibility of operator repetitive motion injury. And abolishing manual steps allows managers to significantly alter workflows, improving human resource allocations.

For example, at a university core services laboratory, busy technicians can devote themselves to other pressing work. As the lab manager overseeing high-throughput DNA purification explains, “The technology has definitely freed up our people. It allows us to work on a number of different projects at a time.”

At a large biotechnology firm, the systems engineering director reports that the Automated Plate Seal Remover contributes directly to the brainpower bottom line. “In the compound management area, we were able to have three or four more scientists doing genuine drug discovery work — rather than being utility operators running sample management sealing.”

A technician at a medical research institute commented that when using the Automated Plate Seal Remover versus manual desealing technology, they don’t have to worry about sudden movements or dropping the plate when desealing. “It is a much smoother way of desealing. And with the Automated Plate Seal Remover’s 100% success rate, we do not worry about the device,” the technician said.



Greater productivity and throughput

Perhaps the chief benefit of seal removal automation: a substantial increase in HTS/HCS lab productivity.

Before, many lab managers were forced to depend on manual plate handling with relatively high rates of error and varying throughput results. Plus, the work required additional human resources. By contrast, the new technology offers a rapid, reliable solution that works virtually as fast as technicians can feed it. For example, the Automated Plate Seal Remover can remove up to 200 seals per hour.

As one scientist says, “This technology is an essential part of our system. We rely on it heavily, running up to 200 seal/unseal cycles a day on that instrument. And we have two of them, so actually you can double that rate.”

Another puts it even more simply: “Productivity in general has increased.”

Less contamination

Unfortunately, traditional methods offer ample opportunities for material from one well or plate to contaminate another during routine processing. Slips, spills, and splashes naturally accompany manual handling. And with piercing machines, the same surfaces come into contact with each plate in succession.

However, superior seal removal automation is designed to eliminate most or all cross-contamination. It's an ideal support for quality control measures that require samples to be sealed until the moment of use.

The system's machine action produces steady movement. And on a device such as the Automated Plate Seal Remover, each section of tape is exposed to one and only one plate. The top of the next plate contacts only the next segment of tape on the roll.

Users say these precautions have proven highly effective. According to one research laboratory manager, “We haven't experienced any contamination issues — which is something we definitely worried about before we were able to adopt this technology.”

Higher reliability

Where manual methods or traditional mechanical devices may produce unacceptable rates of splashing plus rips or other plate/seal damage, adhesive-based seal removal has established a solid record of success in just a few years. With hundreds of units installed in high-productivity laboratories worldwide, this technology has proven to deliver robust, reliable sample access while maximizing sample integrity. Besides working well as a stand-alone unit, it furnishes efficient integration with pick-and-place robotic systems in larger laboratory automation systems.

In automated settings, for example, the Automated Plate Seal Remover is noted for its minimal stoppage rate and extended walkaway times.

As one user reports, “It's very fuss-free. That's why it's one of our favorite instruments. Basically I look at it once a day — just to see if the tape is running out.”

Conclusion

Manual methods and mechanical devices for desealing may create substantial, if hidden, bottlenecks in HTS/HCS laboratory performance. Fortunately, a newer technology — adhesive-based automated seal removal — can break the bottleneck with a smoother workflow, greatly reduced cross-contamination, and higher laboratory throughput.

