easyPick – Reliable colony picking on the Microlab STAR platform

Application note

Top 3 reasons for automation of this application

Colony picking is a very labor-intensive task that is generally performed during cloning protocols. Manual colony picking is both slow and tedious. Automation makes the process more consistent and reliable, as well as considerably faster. The introduction of integrated colony pickers on liquid-handling platforms has revolutionized gene cloning and colony picking workflows, allowing time-efficient and error-free cloning processes together with automation of additional upstream and downstream processes.

Increase colony picking speed.
Achieve consistent and reliable results.
Include automated sample preparation for related downstream processes.

Introduction

Compared to manual colony picking, the automated process is faster, more consistent and reliable. A number of manufacturers offer dedicated colony pickers which process thousands of colonies per hour. For many laboratories, this high throughput is in no relation to the throughput of upstream or downstream automation systems. Thus the costly colony picker spends a lot of unproductive waiting time. With easyPick Hamilton introduces a system which automates both, colony picking and sample preparation for related processes on a single, compact workstation (Figure 1).

Figure 1: Colony picking with easyPick on the compact Microlab STARlet workstation

HAMILTON

easyPick – fully automated colony isolation

Hamilton´s easyPick system combines advanced liquid and plate handling with powerful colony detection. Bacteria, yeast and other fungi colonies as well as mammalian cell clones can be picked with high speed. Upstream and downstream processes can be included.

Technology and method

Image acquisition

A high resolution camera is mounted on the pipetting arm of the instrument (Figure 2). It has its own drive allowing it to acquire images from any place on the deck of the instrument.

Figure 2: The camera is directly mounted on a channel of the Microlab STARlet. Colony picking is performed with the pipetting channels of the Microlab STARlet.

Image analysis

In the proprietary easyPick 4.2 software (Figure 3), the user defines parameters and determines the weighting for the typical criteria to identify colonies:

- Size
- Shape (circularity)
- Proximity to next colony

Based on location of the identified colonies, the software then calculates the robot-compatible coordinates.

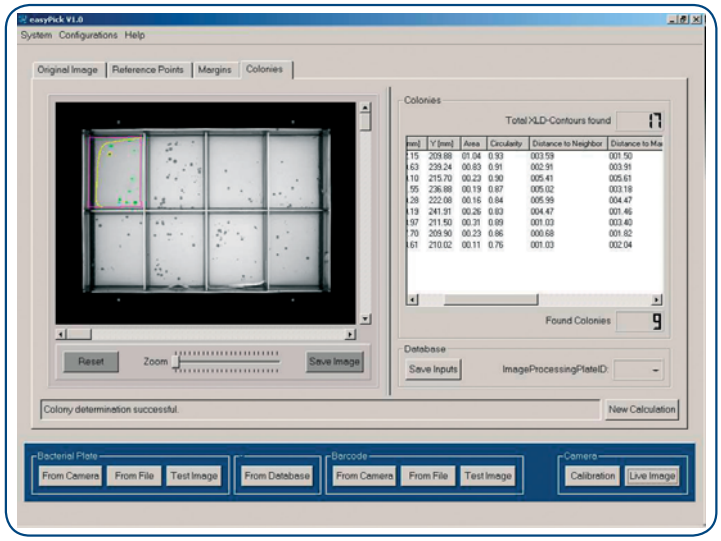

Figure 3: Colonies identified with easyPick. 17 contours were found. 9 have been identified as colonies according to the criteria defined by the user.

Colony picking

With a pipetting channel the workstation then picks the identified colonies and transfers them to the destination plate. The easyPick workstation can pick around 400 colonies per hour using disposable tips.

Sample preparation

The advantage of the easyPick system is the ability to automate a number of processes that are related to colony picking. These include:

- Plasmid isolation
- Sample preparation for PCR, sequencing and others
- Gel loading

System description

The Hamilton easyPick system for colony picking and sample preparation consists of a Microlab STARlet liquid handling workstation (4 or 8 channel configuration), a high-resolution camera mounted on the pipetting arm, a light table on a Multiflex carrier base, and the easyPick software. Hamilton's easyPick system can presently handle the following plate formats:

- Single well Omnitray
- Multi-well plates in SBS format
- Petridishes

The system can be configured with 2-8 pipetting channels depending on the required throughput for the liquid handling tasks. The flexibility of the instrument is further increased with the optional plate handling units (iSWAP or CO-RE Gripper).

Application software

In the proprietary easyPick 4.2 software multiple parameters for colony identification and selection are custom-defined and weighted to meet the requirements of each user. For the automated selection of colonies, set criteria like size, roundness, distance to neighbor are included. Color mode provides selection for different colors and allows techniques like the blue-white screen. The custom programmed software ensures process consistency and reliability in a manner tailored to each user's needs.

Biological test of the system

Biological feasibility was tested using E.coli. Transformed E.coli were plated onto selection media containing kanamycin. After overnight incubation, colonies were picked with easyPick using specifically optimized parameters. For inoculation, the colonies were dispensed into liquid LB medium. Three mixing steps with LB medium and the colonies in the pipetting tip ensured that the inoculation was successful. Analysis of three 96-well plates showed that all 288 colonies had grown and were positive.

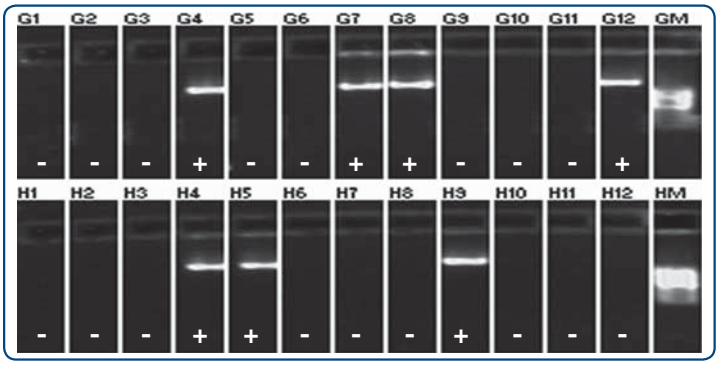

Figure 4: Section of an E-gel® (rows G and H) showing successful isolation of plasmids from all picked colonies (+). No plasmids were found in the empty wells (negative controls, -). Thus, no cross contamination was detected.

Cross contamination

A cross-contamination test was performed picking positive colonies into a 96-well plate in a random pattern. After overnight incubation, the plasmids were isolated and transferred to an E-gel® for analysis (Figure 4). Analysis showed successful isolation of plasmids from all picked colonies. No cross-contamination was detected.

Applicability

The colony picker described here is intended for colony types used in various processes such as cloning or screening of bacteria, yeast or phages. It has also been tested for mammalian cells and can be used for selection of hybridomas and transfected cells for mammalian cell line generation.

Being based on a proven liquid handling platform, it is open to further automation of processes such as plasmid isolation, gel loading or sample preparation for PCR, sequencing and others.

System scalability

Hamilton´s Microlab STARLine platform is designed for modularity and scalability. Automation of upstream and downstream processes such as cell culture and ELISA can be easily added to the instrument. The modular architecture allows increase of deck space when required (upgrade from Microlab STARlet to Microlab STARplus). Variable pipetting units (2-8 pipetting channels) can address the required throughput for liquid handling tasks. Scalability through the addition of workstations, pipetting heads, and plate handling tools ensures efficient resource management to meet the changing demands in Genomics, Cellomics, protein production, and Drug Discovery applications.

Depending on instrument configuration, users of an existing Microlab STAR Line instrument may upgrade their instrument with the easyPick option.

System requirements

Microlab STARlet liquid handling workstation, 4 or 8 channel configuration

Camera channel

Light table on Multiflex carrier base

easyPick software

System dimensions:

Width: 1124mm Height: 903mm Depth: 795mm	Microlab STARlet platform
Width: 1664mm Height: 903mm Depth: 795mm	Microlab STAR platform
Width: 2160mm Height: 903mm Depth: 795mm	Microlab STARplus platform

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