



CASE STUDY

Scale up DNA manufacturing: Customizing a QPix Colony Picker for integration into a fully automated DNA assembly workflow

Introduction

The Edinburgh Genome Foundry (EGF), located within the University of Edinburgh's Centre for Synthetic and Systems Biology, is a dedicated facility for the automated design and assembly of large DNA constructs. The EGF manufactures genetic material for their customers using a fully automated robotic platform, creating and modifying strands of DNA up to 1 mega base pairs in length. These DNA constructs are used to equip cells or whole organisms with new or improved functionality, such as programming stem cells for use in personalized medicine, producing disease-detecting bacteria or increasing the yield of biofuel crops. The EGF was funded through the UK's Research Councils' "Synthetic Biology for Growth" program, with additional investment from the University of Edinburgh's School of Biological Sciences.



Edinburgh
Genome
Foundry

Here at Molecular Devices, our Advanced Workflow Engineering Solutions (AWES) team is dedicated to meeting the unique needs of our customers because we understand that standard doesn't always fit. Our AWES team collaborates closely with customers to fully understand their specific workflow needs and provide effective custom solutions to those needs. In this case study, we showcase how our AWES team helped tailor our QPix™ 420 Colony Picker to meet EGF's goal of providing a fully automated platform for DNA assembly.

Customer challenge

In order to achieve higher sample throughput with accurate sample and data tracking, EGF required an automated colony picking system that was also able to plate and streak multiple samples onto automation-compatible SBS format trays. Additionally, this system had to be able to fully integrate into their existing automated workflow. This required hardware and software modifications to allow access to third-party robotic arms for sample handling and delivery to other instruments in the workflow.

Solution

In order to meet the needs of the EGF, our AWES team modified a QPix 420 system to offer hardware for liquid handling and modified structural design to allow for robotic arm access (Figures 1 & 2). We named this customized configuration the QPix Select-HT system. In addition to providing the QPix Select-HT system, a custom QPix head was developed to allow spreading of 8 samples onto a single, undivided agar tray that meets SBS standards for microplate dimensions. Open API and software support for each uniquely tailored process were also provided. The QPix Select-HT system was fully integrated by the EGF into their automation platform which includes 3 robot arms, 2 liquid handlers, incubators, PCR machines (both standard and real-time), an acoustic dispenser, centrifuges and plate sealers and peelers, de-lidders and a capper/decapper (see Figure 3).

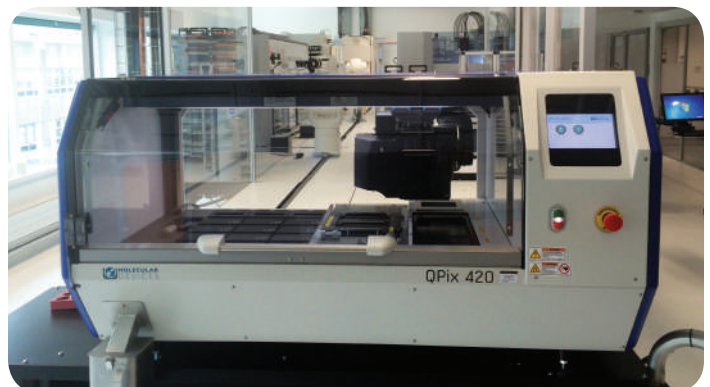


Figure 1. The QPix Select-HT system is shown. The back of the instrument has been modified to allow robotic arm access.

Benefits

With the ability to plate up to 200 samples or pick up to 3,000 colonies in one hour, the QPix Select-HT system provides the necessary high-throughput sampling needed for timely delivery of products to their customers. Each process has reliable sample tracking and data management as well, allowing the EGF to manage sample data effectively for the entire automated workflow. Integration of the system into a fully automated workflow also reduces the employee labor hours required to run the system and therefore the financial costs for each EGF project.

The close collaboration between Molecular Devices' AWES team and the Edinburgh Genome Foundry resulted in an effective solution to their specific workflow needs, allowing the EGF to meet their goal of a fully automated platform for DNA assembly.



Figure 2. View from the inside of the QPix Select-HT system, looking out towards the automated platform.



Figure 3. Part of EGF's fully automated setup is shown here. The QPix Select-HT system (red arrow) is in the upper left, behind the robotic arm. A second robotic arm is also visible, approaching a plate hotel.

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