Automating Scientific Workflows

Key Words

Workflow; Automation; Process; Barcode Tracking; Plate Delidding;

When discussing a project that involves workflow automation, a variety of questions come to mind. The questions below will help shape the conversation and determine the scope of the project.

Microplate Workflow Automation's Top Ten Questions

1 What is your overall workflow or process?

This is the all encompassing question - what are you trying to do? Is the system going to perform a specific assay or does it need to "do it all."

2 What steps of your process do you want/need to automate?

Not all steps in a process are applicable to automation i.e. centrifuging vials. On the other hand, certain steps like plate delidding may be essential to maximize walk-away time.

3 What instruments do you need to perform that process?

Some instruments like plate reading, dispensing and washing are needed for a wide variety of assays. Other assays require temperature controlled incubation, plate sealing, barcode reading and plate centrifugation. Getting a feel early on for what the science requires will help scope the project.

4 How is this process being done now?

Is the process currently being performed by lab personnel, externally, via another platform - this gets at the question, why automate? Are people running to different stations, watching instruments complete?

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5 What is the expected or desired throughput of the system? Do you see the need growing over time?

System throughput is a combination of both the total number of plates and just as important, the total number of operations per plate. For example, 10 plates being washed one time is 10 operations. Alternatively, 10 plates washed 3 times, dispensed twice, incubated and read is 3x10 + 2x10 + 10 + 10 = 70 operations! If you include delidding at each operation, that's well over 100 operations on just 10 plates. To put things in perspective, 50 operations is where one person usually goes crazy!

6 What is the total system capacity? Or, what is the desired length of walk-away time?

Sometimes this is answered simply in plate numbers i.e. we want to do 100 plates per day. Alternatively, a particular assay that requires several hours to complete (usually due to long incubations) means that they just want to run it overnight.

7 Are there any specific time constraints to the assay?

This is most often seen where one operation must follow another within a specified amount of time i.e. an ELISA assay where a reagent is added and the plate must be read within a 2-3 minute window of time. Alternatively, a specific incubation time must be equal across all plates to improve data quality.

8 Will it be beneficial to track barcodes and create an audit trail for the assay?

Barcode tracking is important for reasons ranging from accounting to troubleshooting batch errors.

9 Are there any safety or air requirements for the system?

Some facilities require guarding around a system, other groups need special air filtration (HEPA) to keep the environment clean of contaminates.

10 Are there any spatial restrictions for the system?

Automated solutions can exceed the footprint of a benchtop, particularly if large instruments are required. Determining if there is a specific location in a lab for the system is important. Dimensions of the available space will help determine the style the solution takes on.

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North America 1-800-365-7587
Europe +49 (0) 6184 90 6476
Australia/Asia Pacific +61 8 8208 8200
China +86 800 810 5118
Japan +81 0120 753 670
India +91 22 6742 94 94

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