

Analytical Sample Transport – A Pneumatic Solution

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Abstract

Pneumatic air transport systems can provide a safe, efficient and rapid means of sending samples within different departments of a research laboratory. These systems are often used within a hospital, supermarket or bank and represent an effective method for sending samples or packages to different departments

TTP LabTech has used this technology for over 6 years, predominately in our comPILER and comPOUND systems

Recently, the technology has been applied to an automated chemistry synthesis project. All compounds produced during synthesis are analysed during and after processing using a variety of different methods. TTP LabTech's transport system sends sample 'vials' from a central hub directly to the sample collection device, then to the analytical hardware and finally to a storage rack or waste collection point

Conclusion

It is expected that this pneumatic system could be used in any research laboratory where samples require movement to analytics

In addition, we believe this system will reduce the time taken for samples to be sent, analysed and returned to the scientist, thus improving productivity

1 Analytical Sample Transport

The transport and distribution system comprises a stand-alone hub, delivery tubes and sample stations. Empty sample vials are sent from a central store (or SBS format rack) directly to the sampling device, the analytical hardware and then to a waste collection point. The hub coordinates the movements and only one vial is moved at any once

A network of polymer tubing interconnects between 2 and 32 stations via the hub. Stations may be sampling points, instruments, storage facilities or any other customer requirement. Speed of transfer is determined by pipe length and pneumatic blower pressure. Intermediate 'boosters' are fitted for longer distances

2 System Functionality

The system has the following functionality:

- On-demand supply of a single vial to a sampling device
- Barcode scanning of all sample vials
- Routing to any available analytical device
- Supply of filled sample vial directly under auto sampler needle of the analytical instrument
- Removal of processed vial from the analytical instrument
- Disposal of processed vial (locally or centrally)
- Movement log
- Delivery of 'standards' for analytical instrument calibration (these can be simply be placed on one station)

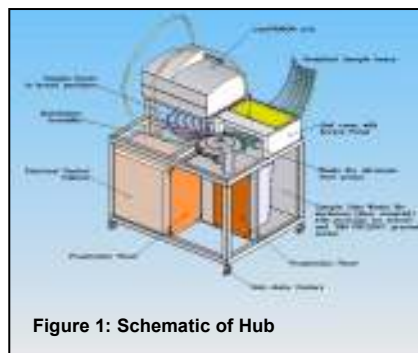


Figure 1: Schematic of Hub

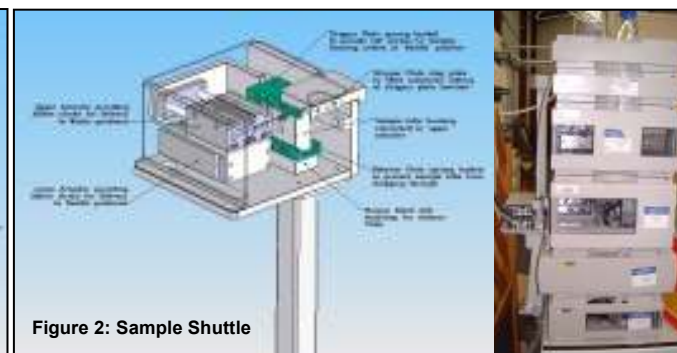


Figure 2: Sample Shuttle

3 System Specification

Performance

Transport speed: 5 ms⁻¹ max
Barcode read time: 1 second

Specification

Total Stations: 32
'Destinations': From 2 to 30
These can be Analytical or to other systems
Supply port: 1 (empty vials)
Waste port: 1
Camera viewing port for barcode reader

4 System Operation

- Samples are delivered in 1.4ml Matrix Micro-tubes via the pneumatic sample transport mechanism
- A shuttle device (Figure 2) transfers the sample to a position accessible to the injection head
- The sample is allowed to settle prior to injection from the top of the sample volume
- The resulting data is tabulated and archived

5 Current System Performance

Sample vials can be delivered to multiple HPLCs in series. Sample analysis is performed by a number of Agilent 1100 HPLCs and SFCs. One or more of these units and the required method(s) is selected since the HPLCs are configured to run different methods

Interfaces

Sample transport system
Process manager on the server

Inputs

Empty Microtubes or Standards
Method (from configurable list of protocols created using the Agilent software) defines what data is collected
Settling time (s) (configuration)
Injection height (mm from base of micro tube) (configuration)

Outputs

Microtube (minus injected sample)
Analytical data