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Comparing the Energy Consumption of Different LC Single Quadrupole Mass Spectrometry Systems

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Introduction

Laboratories are among the world's most resource-intensive facilities, consuming up to 10 times more energy than a typical office space. With more than 82% of labs now tracking sustainability metrics,¹ organizations are increasingly focused on reducing environmental impact and meeting ambitious net-zero goals.

New tools empower researchers, procurement teams, and facility managers to make informed, environmentally responsible choices. The My Green Lab ACT Ecolabel sets the industry standard for transparent, third-party-verified data evaluating the environmental impact of a product's entire lifecycle.

Complementing this, [Agilent CrossLab Connect](#) and Agilent [InfinityLab Assist](#) provides continuous monitoring of key operational metrics including solvent and power consumption—helping labs make data-driven decisions that reduce resource use and operating costs. Here we evaluated the upfront and operational, environmental, and business impact of the [Agilent InfinityLab Pro iQ and Pro iQ Plus Mass Detectors](#) (Figure 1).

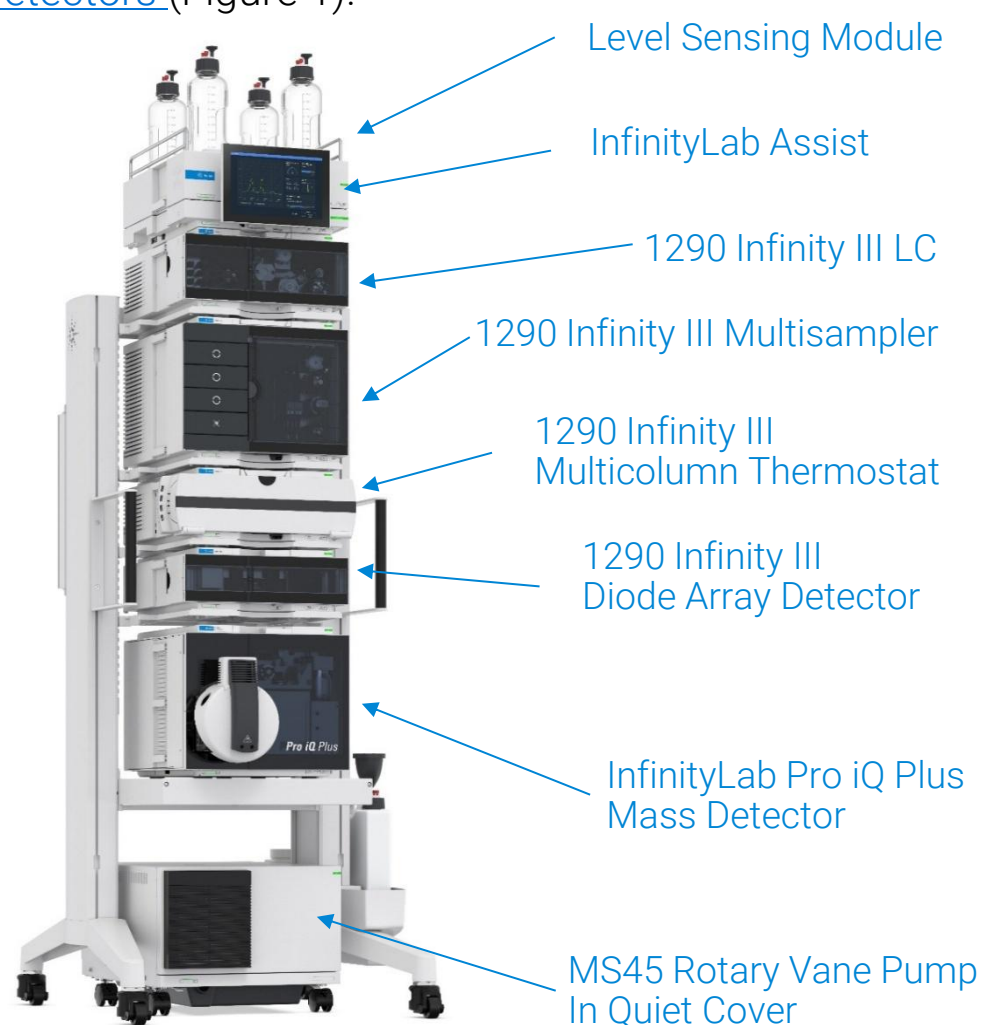


Figure 1. A common InfinityLab Pro iQ Mass Detector system configuration. Including module labels. This mobile configuration is approximately six feet tall and requires less than one square meter in laboratory real estate.

Experimental

Instrument Design and Production Consideration

The My Green Lab® ACT® Ecolabel

To evaluate the product-level environmental impact, we reviewed the My Green Lab® ACT® Ecolabel for both the Agilent InfinityLab Pro iQ Mass Detector and the Agilent InfinityLab Pro iQ Plus Mass Detector (Figure 2.)

The ACT Ecolabel uses a science-based, 100-point weighted score, with details on product impacts such as energy use, materials, chemical hazards, and end-of-life options—plus an evaluation of the manufacturing facility and company commitments to reduce greenhouse gas emissions.

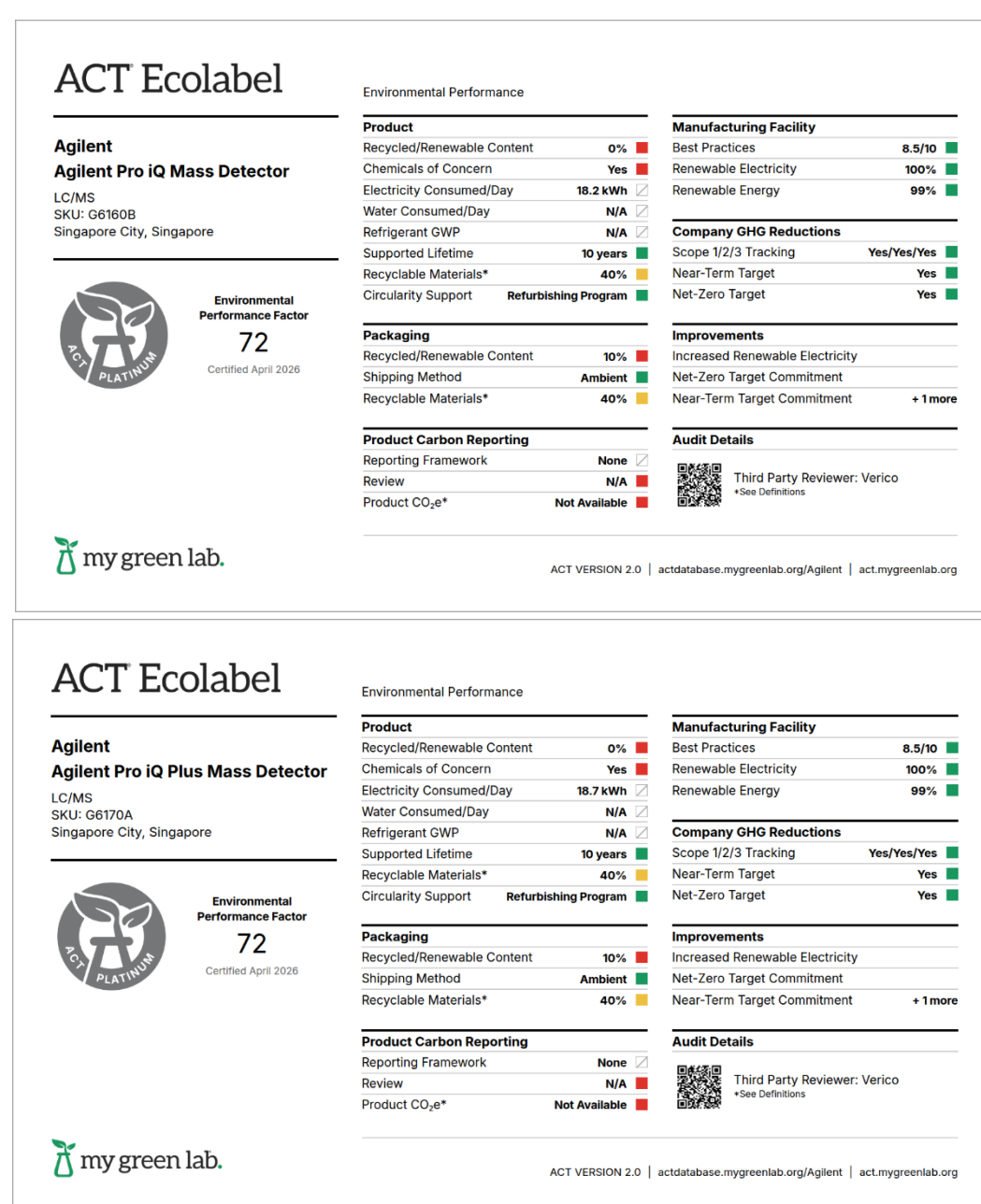


Figure 2. The ACT Ecolabel uses a science-based, 100-point weighted score to evaluate key sustainability attributes, including energy use, materials, supported lifetime, and end-of-life options—plus an evaluation of the manufacturing facility and company commitments to reduce greenhouse gas emissions.



ACT Label Database

Operational Considerations



Figure 3. Agilent CrossLab Connect real-time capabilities and outcomes.

Instrumentation, Power and Cost Monitoring

Energy usage of the Agilent InfinityLab Pro iQ Mass Detector (G6160B) and the InfinityLab Pro iQ Plus Mass Detector (G6170A) source with the Agilent 1290 Infinity III LC (G7104A) equipped with a multisampler (G7167B), Multicolumn Thermostat (G7116B) and diode array detector (G7117B) using an Agilent Advanced Power Sensor (SST-APS-1015) in KWh using Agilent CrossLab Connect (Figure 3), an enterprise asset monitoring platform was used to provide detailed performance reporting. Data was acquired over 2.4 GHz wifi, data packets and were uploaded at a rate of 5 packets per second for 55 MB/day for all instrumentation under investigation using an Agilent Communication Module (SST-WIFI-02). Line current, relative ambient temperature and relative humidity of each instrument was measured during routine operational conditions. The Out-of-range values could indicate assay risk, while the line current can be used to estimate instrument power costs.

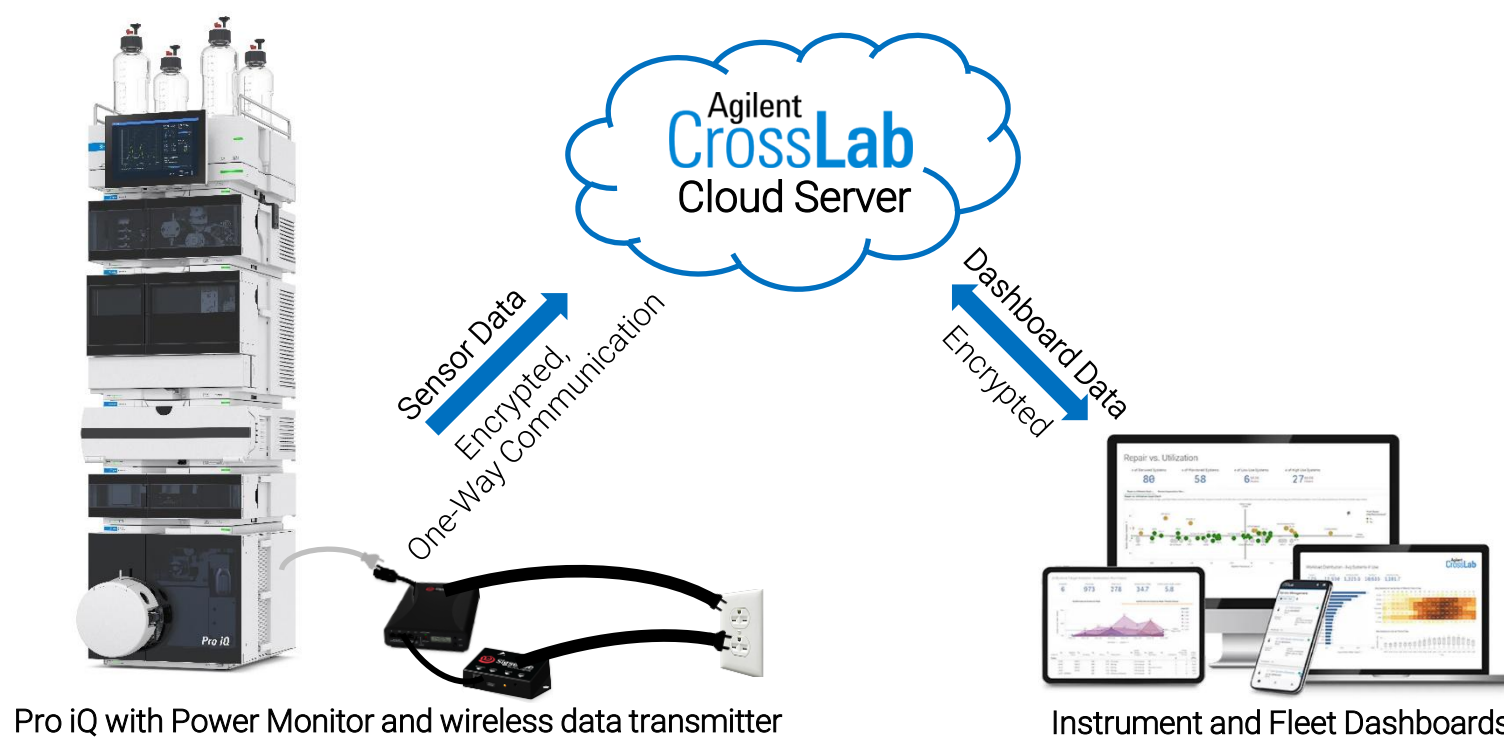


Figure 4. Data flow for monitor-enabled asset management. A power monitor attached to an InfinityLab Pro iQ Mass Detector streams encrypted sensor data to a secure cloud service. The platform's analytics infer instrument state and utilization and return encrypted dashboard views to web and mobile interfaces for real-time status, alerts, and reports.

Results and Discussion

Environmental Monitoring

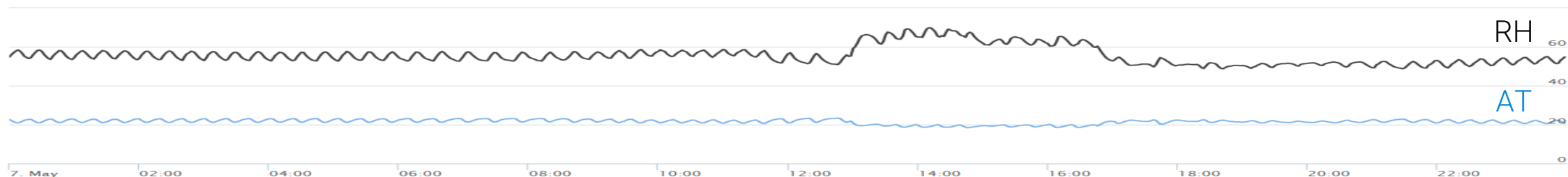


Figure 5: Single day Ambient Temperature (AT) and Relative Humidity (RH) at one InfinityLab Pro iQ Mass Detector under routine operating conditions. Out-of-range values could indicate assay risk, so alerts prompt added precautions.

Power Consumption Monitoring

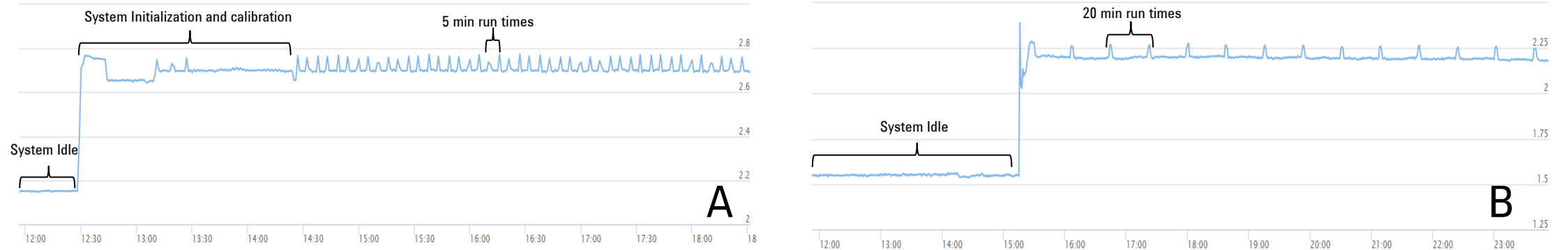


Figure 6. Data flow for monitor-enabled asset management. A power monitor attached to a InfinityLab Pro iQ Mass Detector (A) and InfinityLab Pro iQ Plus Mass Detector (B) streams encrypted sensor data to a secure cloud service. The platform’s analytics infer instrument state and utilization and return encrypted dashboard views to web and mobile interfaces for real-time status, alerts, and reports.

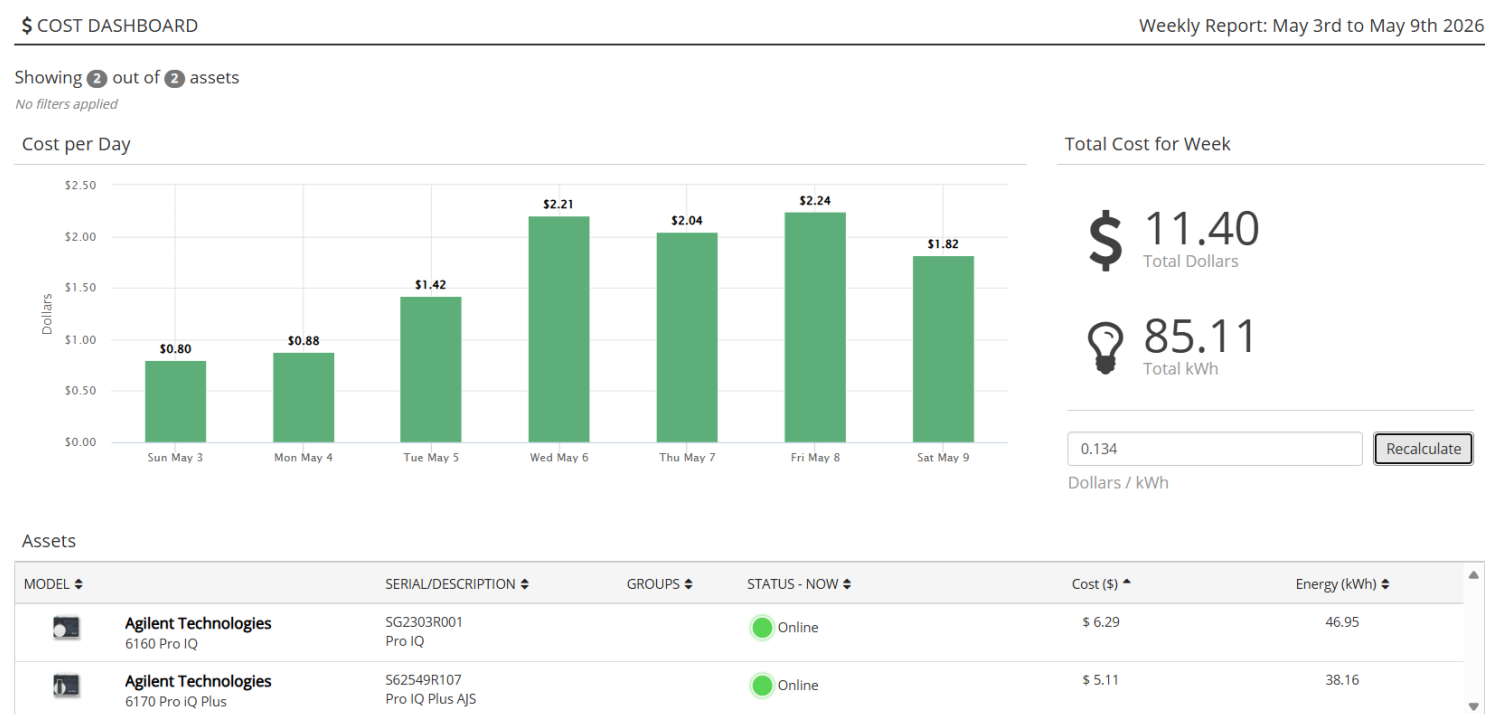


Figure 7. Agilent CrossLab Connect provides cost estimates based on the local kWh price via simple to use dashboards. Here we show cost (\$) and energy consumption (kWh) based on the local electric rates (Cedar Creek, TX).

Conclusions

By taking advantage of existing laboratory instrument design (ACT® Ecolabel) and real-time monitoring (Agilent CrossLab Connect) tools, lab managers and procurement agents can significantly improve both sustainability and operational cost goals. CrossLab Connect provides actionable insights into energy usage, cost and utilization allowing for data-driven decisions to reduce both environmental footprint and operating costs.

References

1. [2023 Agilent Frost & Sullivan Survey](#)

<https://www.agilent.com/en/promotions/asms>

This information is subject to change without notice.

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