

Design Fusion

AT A GLANCE

TECHNOLOGY	Demand controlled ventilation, Power over Ethernet (PoE)/DC power distribution, Differential pressure and temperature monitoring, Digital twin software, Wireless RF mesh network for IoT devices
CONNECTED DEVICES	Canarm inline HVAC blower, Belimo Damper Actuator, Multiple HP Jet Fusion Pro 3D printers, Differential pressure sensors, Thermistors
PRODUCTS	SpacrGrid, SpacrSense-IEQ, SpacrSense-Pressure, SpacrApp
LANDLORD	Cherishome Living
TENANT	Design Fusion 3D Printing Lab
SPACE	Commercial - multi-tenant
LOCATED IN	Toronto, Ontario
DEPLOYED IN	July 2020
SAVINGS SUMMARY	CapEx: roughly 50%, OpEx: roughly 70%



About the Client

Additive manufacturing brings digital flexibility and efficiency to manufacturing operations, and Design Fusion is making additive adoption easy.

- The Design Fusion is a leading Siemens PLM reseller, and their 3D Printing Lab is an additive manufacturing facility.
- The Design Fusion 3D Printing Lab is also one of Cherishome's tenants.
- Cherishome is a major developer, that's worked with Argentum on other projects. It was founded in 1981, when its founder purchased an apartment building in North York, Ontario.
- Cherishome owns over a dozen rental buildings in Canada, as well as nine communities and 2100+ suites in the United States.

Vincent Adinkrah, Energy Storage Solutions Engineer, had this to say about the team at Design Fusion:

"No simulations task too small or too complex...the Engineering Team brings their knowledge of multiple industries, materials, NX Simulations and Flow FD to ensure the uniqueness associated with all simulations are kept front and center." - Vincent Adinkrah - SPS

SPS / innovative
affordable
power
an Energy Storage Company

The Challenge

Design Fusion was experiencing problems with the air extraction system for their printers, and this was slowing their printers down, so they contacted Argentum to help them improve the uptime of their printers. In order to optimize the printer's operation, the real challenge was to maintain a constant, specific pressure level at the outlet of the printer's exhaust.

Design Fusion also wanted the ability to connect a central exhaust system to multiple printers, and improve the efficiency of this system. To do this, they needed to be able to monitor and automate fan speeds so that fan power consumption is minimized.

Air quality is another important factor that contributes to how efficient an air extraction system will be, so they also wanted to be able to monitor the air quality in their space. They wanted to ensure that these controls could also be automated so that energy output of the HVAC system could be increased or decreased depending on the ventilation demand. This would take some of the workload off of the HVAC system itself.

Argentum's system provides solutions to all of these problems, while additionally enabling Design Fusion to control the automations related to these systems on one cloud-based, user-friendly dashboard (the SpacrApp).

A Short Summary of the Challenge:

- Improve uptime of 3D printers.
- Precisely control and monitor pressure at the exhaust of the printer.
- Monitor air quality.
- Automate the HVAC system based on pressure and air quality readings.
- Monitor and control everything on a web based dashboard.

The Solution

Based on the client's request, our team at Argentum determined that SpacrGrid (DC Power Distribution), SpacrSense (wireless sensors), and the SpacrApp (digital twin software) would be the ideal solution to monitor and automate Design Fusions's HVAC system and improve the uptime of their printers.

The wireless sensors we used:

- SpacrSense-IEQ (Indoor Environmental Air Quality) sensor: The IEQ sensor enables the client to monitor air quality, temperature, humidity in the room, and more. Data collected from the IEQ sensor can be used to verify leaks in the exhaust system by monitoring VOC (volatile organic compounds) content around the printer.
- SpacrSense-Pressure sensor: The pressure sensor allows the client to monitor the pressure and air temperature inside of the air extraction system, and at the 3D printer outlets.

The technology and Argentum products we used to achieve Design Fusion's results include:



Digital Twin Software



DC Power Distribution

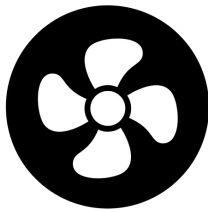


Wireless Sensors

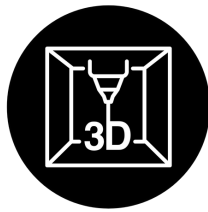
The combination of these Argentum products provides these additional benefits (and more):

- SpacrApp brings the system and data together by allowing all of the collected data to be visualized and tracked over time. With the SpacrApp, DesignFusion can also monitor, control and automate all of the devices powered by the SpacrGrid, giving them much more control over their HVAC system's power consumption and efficiency.
- The SpacrNodes that are a part of the system (and create a wireless mesh network), enable the Argentum system to optimize fan speeds, and reduce energy consumption.
- All actuators (ex. electric motors) use only a single cable to carry power and control data, saving 50% on wiring and installation costs.

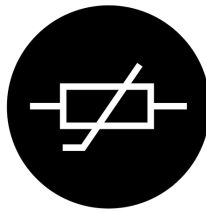
Devices connected to the Argentum system:



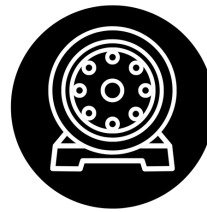
Variable Speed HVAC



3D Printers



Thermistors



Electric Motors

By integrating these devices with indoor environmental quality (IEQ) sensors, occupancy sensors, and our digital twin software, we enabled Design Fusion to monitor, control and automate their HVAC system and printers based on real-time sensor data. This allows Design Fusion to optimize energy consumption, as well as equipment performance.

The Results



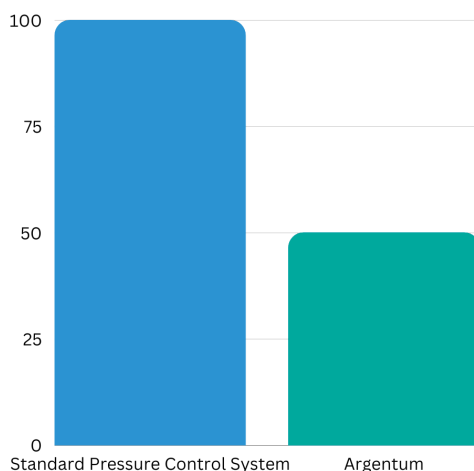
The Argentum system essentially took various pieces of low-cost HVAC equipment that are not natively intelligent, and turned them into “smart devices”.



Argentum improved the uptime of Design Fusion's printers, enabling their facility to be more productive.

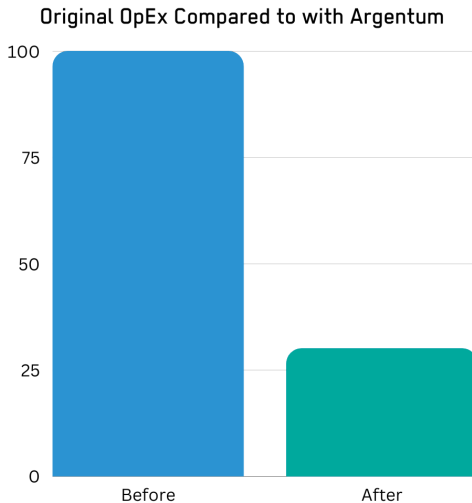
Financial Results

Total Cost of Alternative Compared to Argentum



50% Capital Expenditure Savings

- A standard pressure control system would have required complex integrations, and the use of higher cost HVAC equipment with smart features. Argentum's products were used collectively, as part of a system, to achieve the same (or better) results, when compared to what a standard pressure control system would have provided.
- Less cost for controls.
- Less wiring costs.



70% Savings on Operational Costs

- Connection of the Argentum Digital Current™ system to their HVAC systems and printers is mainly where these savings come from.
- New ability to precisely control fan speeds (demand controlled ventilation). This is enabled by real-time data collection, and our building control and automation system (SpacrApp). Without these technologies, the client would not be able to automate their air extraction system based on their specific pressure requirements.
- Design Fusion now has historical records of air pressure and temperature at the 3D printer's outlets (can be used for validating warranty claims and service requests).

All in all, we implemented demand controlled ventilation, Power over Ethernet (PoE)/DC power distribution, differential pressure and temperature monitoring, digital twin software, and a Wireless RF mesh network for IoT devices through our Argentum Digital Current™ system. Ultimately, since the implementation of our system, Design Fusion has been able to save energy costs, reduce emissions, improve the uptime of their printers, and optimize the efficiency and performance of their air extraction system.