

CASE STUDY

Custom Industrial System for Oil
Pressure Drop Testing Across Heat
Exchangers for Aircraft Engines



Background

A prominent aerospace and defense manufacturer specializing in thermal management systems approached Burt Process Equipment to design a custom test bench. This system would be used to measure oil pressure drop across heat exchangers in aircraft engines, a critical parameter in ensuring the reliability and efficiency of these components. The manufacturer required a system that could simulate real-world engine conditions while providing precise and reliable data to optimize their product designs.



Challenges

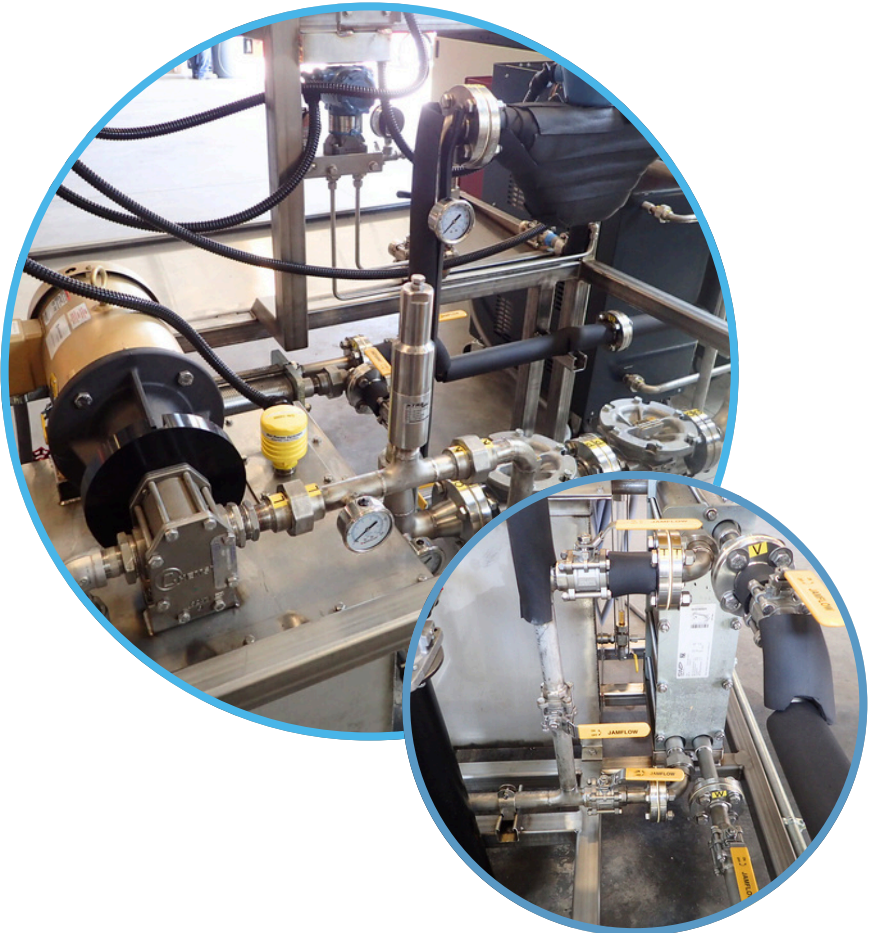
The project required a system that could:

1. Measure minute pressure drops with high accuracy under various flow rates and temperatures.
2. Simulate complex engine conditions through advanced temperature, flow, and pressure controls.
3. Withstand high-pressure and high-temperature environments without compromising safety or performance.
4. Automate data acquisition, allowing for real-time monitoring and remote-control capabilities.
5. Meet stringent engineering requirements for layout, process instrumentation, and electrical systems.

Engineering Scope

Burt Process Equipment's comprehensive engineering services provided:

- System Layout Drawings: Detailed system configuration tailored to client specifications.
- Process and Instrumentation Diagram (P&ID): Documenting the plumbing and instrumentation setup for precise operation.
- Electrical Ladder Diagrams: Including control panel design according to accepted practices.
- Bill of Materials (BOM): Listing all system subcomponents and cross-referenced with the system design.
- Complete System Design Prints: Engineering drawings for every aspect of the system.



Equipment Description

Burt Process Equipment engineered a custom oil pressure drop test bench with the following components:

- **Structural Design:** The test bench was constructed from 304 stainless steel and measured approximately 60" L x 36" W x 32" H, with an additional 24" high backdrop. A 1" drain connected the containment pan back to a 50-gallon reservoir tank for efficient oil recirculation.
- **Oil Reservoir and Pump:** The system included a 50-gallon 304SS reservoir tank and a 5 HP multi-stage centrifugal pump with a variable frequency drive to control oil flow. Isolation valves, a discharge check valve, and specialty filter housings were also installed to ensure clean oil circulation.
- **Cooling and Heating Components:** An air-cooled chiller provided up to 4 tons of cooling, with a control panel featuring a 7" touchscreen and PLC control for precise temperature management. Temperature control unit with a 9kW heater regulated oil temperature, capable of reaching up to 250°F.
- **Heat Exchanger and Instrumentation:** A 15 GPM plate and frame heat exchanger with manual valve control enabled heating and cooling cycles. A Coriolis flow meter and differential pressure transmitter ensured accurate flow and pressure measurements.
- **Control Panel:** The system featured a UL labeled, NEMA 4 control panel with comprehensive control elements, including a PID controller, disconnect switch, and various relays, lights, and indicators to ensure smooth operation.





Burt Process Equipment's Capabilities

Burt Process Equipment takes a hands-on approach when developing industrial systems, working closely with clients to ensure customized solutions. Burt Process Equipment's team includes mechanical, chemical, and electrical engineers, as well as project managers, programmers, and CAD designers. This diverse team allows Burt Process Equipment to offer complete engineering services from concept to completion, ensuring that each project is tailored to specific client needs.

With a commitment to delivering turnkey solutions, Burt Process Equipment's application and design engineers collaborate with clients from the first consultation to develop detailed specifications. Every step of the way, Burt Process Equipment ensures that customized equipment meets performance requirements, streamlining the development process. Their experience in crafting custom systems ensures that even the most complex requirements are met with precision.

Results

The custom test bench provided the aerospace manufacturer with a high-precision tool to evaluate oil pressure drop across their heat exchangers. Key outcomes included:

- **Enhanced Precision:** The use of advanced sensors, flow meters, and pressure transmitters allowed the client to capture highly accurate data, essential for optimizing heat exchanger designs.
- **Operational Efficiency:** The automated controls and real-time data acquisition reduced manual effort and testing times, allowing the client to focus on analysis and product development.
- **Durable and Reliable:** The system was designed to withstand the rigorous demands of prolonged testing in high-temperature and high-pressure environments, ensuring long-term performance and safety.



Conclusion

Burt Process Equipment's ability to deliver a fully integrated, custom oil pressure drop test bench underscores their expertise in developing complex industrial systems. By partnering with Burt Process Equipment, the aerospace manufacturer gained access to a tailored solution that significantly improved their testing processes, ensuring the highest standards of performance and reliability for their thermal management products.