

Application Case Study: Temperature Protection in Airport Passenger Boarding Equipment



Introduction

For this case study, we need to pack our bags and head to the airport! As part of an infrastructure improvement initiative at a major northeastern airport, an industrial component distributor of ours received an invitation to quote parts to an equipment manufacturer who were themselves quoting to build new passenger boarding bridges for the project. The

equipment manufacturer's request included an option for the distributor to quote any value-added alternatives that would help all parties win the project, and that prompted a phone call from the distributor to our office. When we answered the call, the distributor cut right to the chase, asking, "Have you ever heard of cab floor heating systems for airport jet bridges? I have an idea to run by you."

About Us

As a veteran-owned small business, Whitman Controls is dedicated to supplying premium quality, reliable, technologically advanced instrumentation for use in nearly any application. Our Bristol, CT manufacturing facility embodies over 40 years of engineering, fabrication, and customer service expertise, serving both end-user and manufacturing customers nationwide through direct and distribution channels.

Application Summary

For most airline travelers, the short walk from the terminal gate to the aircraft is just another few steps in their trip, but there is much more than meets the eye to this little part of the journey. To get into their aircraft, travelers walk down a Passenger Boarding Bridge (PBB) – otherwise known as a jet bridge - which is a highly engineered piece of semi-fixed equipment that creates a seamless transition space from terminal to aircraft. Not only must the PBB create a smooth physical transition between the terminal building and the plane, but it must also create a safe, comfortable thermal transition as well. The most sensitive area of a PBB is the cab, which is the space between the PBB's hallway and the aircraft door. This area becomes fully exposed to outside weather, making it a risky place for slips and falls due to rain, ice, and snow. These hazards can be exacerbated by contrasting air temperatures in this space as well, where warm terminal air can meet cold outside air, causing condensation buildup. PBB's equipped with cab floor heaters directly combat these risk factors by warming the cab's floor, deterring moisture buildup of all types while also enhancing passenger comfort as they step into the aircraft.

Challenge

As with most publicly funded projects, this project began with a simple Request for Proposal that laid out an inventory of components needed for an upcoming airport upgrade project. A major airport equipment builder sent in this RFP to their regional component distributor for

quotes on all the hardware and sensors that they would need to build out new Passenger Boarding Bridges to replace outdated units at this airport. The RFP listed out all of the model numbers specified by their engineering team, but included a statement that the distributor could suggest alternatives should they offer a cost or technical advantage worth considering.

When the distributor's sales engineer got to the cab floor heating section of the RFP, they quickly noticed that the system was a bit more complex than they would have expected. In fact, the engineer noted that the design was closer to an online process control system than an equipment protection system. Since this distributor routinely worked on similar projects in much heavier industries (such as cabin deck heating in mining excavators), they knew they were looking at a viable opportunity to offer alternative components at a lower cost. As this distributor's preferred supplier of economical, OEM-grade sensors, they gave us a call and ran us through the RFP's description of the floor heating system:

- The hydronic sub-floor heating system consisted of a closed-loop water circuit, electric heating element, and a recirculating hot water pump.
- The heating element would be controlled using a temperature controller programmed to a single setpoint provided by a thermocouple installed in the water loop.
- The thermocouple would sense the return water's temperature, and if the temperature was too low, the controller would activate the heating element. Once the return temperature climbed above the setpoint, the controller would switch the heating element off.
- This discrete on/off control would cycle multiple times throughout the day automatically, assuring that the hot water loop was always at or above the required temperature setpoint.

Referring to their experience with other projects, our distributor's engineer explained that they were concerned with the entire cab area being heated in a single loop as that would lead to

uneven heating and potentially hazardous hot spots. Further, the level of instruments and controllers needed for what should be an otherwise simple thermal limit function seemed to be excessive. We agreed with the engineer's observations, and after discussing a few alternatives on the instrumentation side, they went back to their customer to present their conclusions.

"As a distributor, our goal is to connect customers to the best manufacturers' products. On this project, Whitman's creep-action thermostats were definitely the right product, and opened the door for solving the larger problems of the heating system design." - Key Account Manager, Confidential National Industrial Controls Products Distributor

Solution

After a few days of working out alternatives with their customer, our distributor's engineer updated us on what they intended to quote as an alternative solution to the cab floor heating system. Their plan was as follows:

- Install a [Whitman TP series Economical Stainless Steel Temperature Switch](#) to replace both the previous thermocouple and the temperature controller.
- This TP temperature switch operates on a creep-action basis, using an internal bimetal element that opens or closes its relay switch as the fluid temperature crosses a preset setpoint.
- This creep-action design is specifically engineered to serve as a thermostat or thermal protector for precisely these types of thermal limiting applications. The TP sensor is available with configurable setpoints between 50°F and 250°F in 25°F increments and with a +/-5°F accuracy.
- To solve for hot spots, the new hot water circuit was broken into two zones - one zone for the main center walk path that would see heavy foot traffic, and one zone for the peripheral left, right, and front edge areas that would only receive incidental traffic.
- Each zone was plumbed with a solenoid valve on the return leg that could cut flow to one zone independent of the other. Slightly upstream of each solenoid valve, a TP sensor would be installed to sense the return heating water temperature for that zone. Each

sensor would be wired to the downstream solenoid valve directly, such that each sensor would switch to open or close its corresponding valve based on the temperature detected within that zone.

- The heating element would be specified with its own integrated thermostat, completely eliminating the need for an external temperature controller to manage the heater's cycling.

With the plan set and the alternative solution quantified, we helped our distributor formulate their RFP response by providing submittal cut sheets and warranty statements for our sensors, and wished them luck in winning the project.

Results

Several months later, we received word that our distributor's PBB equipment manufacturer was successful in winning the project! At last check, they were entering final design for their solution which included about a dozen design alternatives that brought the overall component costs down by 40% (including our cab floor heating system piece). Thanks to the distributor's keen insight and motivation to support their customer, everybody involved benefited tremendously. The next time we fly through that airport, we'll pause for a few extra seconds at the end of the jet bridge and appreciate the evenly distributed, safe, reliable floor heating going on underneath our feet.

Data Bullets

- **40%** component cost savings using distributor alternatives
- **100%** reduction in hot spot damage events using the new cab floor heating design
- **1** day's lead time on in-stock OEM sensor models
- **>20** million passengers a year benefiting from the airport's new jet bridges

Here at Whitman Controls, our values drive us to provide the highest level of servant partnership that you can find. To discuss your applications or to learn more about our capabilities, please contact us at (800) 233-4401, via email at info@whitmancontrols.com or online at www.whitmancontrols.com.