

Jane's Airport Review

Ice sensors deliver cold relief

Improved and more accurate runway condition data can improve airport operational efficiency

Ben Vogel

London

Frits Njio

Shutting down an icy or snow-covered runway slows down the acceptance rate of aircraft, with the resulting delays causing disruption to passengers' journeys. Meanwhile, airport operators and airlines are left to count the financial cost.



Lufft IRS31-UMB passive runway sensor. (Lufft)

1520318

In December 2010, for example, severe winter conditions prompted Heathrow to temporarily shut down its two runways. All flights were grounded on 18 December, while the second runway remained shut until 21 December. The disruption cost the airport operator and British Airways GBP25 million (USD42 million) and GBP50 million respectively, and prompted a reassessment of how the UK hub responds to operational challenges in winter.

One solution is to heat runways via a subsurface electric current or embedded pipes, rendering them permanently free of snow and ice. The US Federal Aviation Administration (FAA) funded two small-scale proof-of-concept demonstrations of new runway heating methods, and it issued an Advisory Circular in 2011 that established minimum performance requirements for the design, construction, and maintenance of heated pavement systems.

The FAA argued that heating systems could enhance safety, minimise disruptions caused by heavy snow, provide a 'greener' option, and reduce snow and ice removal time. However, disadvantages of heated runways include high operating costs and complex installations, so live operational deployments remain some years away.

Another answer is to respond to weather forecast data by applying anti-icing chemical agents to an airport runway before a deterioration in the weather. Yet as this is financially and environmentally costly, airports prefer to do it as infrequently as possible.

Schneider Electric developed its Ice Detection System (IDS) as a decision-support system to address the need to reduce the frequency of runway de-icing and anti-icing. The IDS comprises a network of sensors near the runway, data from which is integrated with an information management system. IDS also includes an optional forecasting system for decision support.



Lufft ARS31-UMB active runway sensor. (Lufft)

1520319

The first IDS installation with Belgocontrol at Brussels Airport went live in 2013, and Schneider Electric is offering the system to other airports. "We can install IDS as part of an airport's overall weather observation system," said Schneider Electric Weather Systems Managing Director Jim Block. "It has an average life cycle of 10 years."

An effective system requires atmospheric sensors for temperature and wind speed data, but accurate information is also needed about conditions on the runway surface. "So you need pavement sensors," he noted.

The IDS includes passive and active smart pavement sensors, each type manufactured by Lufft Instruments of Germany. Passive sensors measure the temperature of the pavement and at depths of 5-30 cm. "But it is also measuring whether there is water or ice on the runway, to tell you the condition: whether it is dry, wet or freezing," Block said. A small window on the passive sensor also measures the chemical concentration of the fluid on the runway.

"We combine that information with an active sensor," he told IHS Jane's . "This active sensor not only measures the chemical concentration but also drops the temperature of the sensor. It alternately cools itself to -5 to -10 degrees C, and then warms itself back to the ambient pavement temperature and repeats the cycle. By doing this cooling, it measures the freezing point of what is actually on the runway."

Neither the active nor the passive sensor on its own provides an accurate calculation. "We found in working with our launch customer Belgocontrol that you use a combination of both sensors," said Block. "It gives a complete variety of information or any combination of... expensive non-corrosive chemicals like Cryotech NAAC."

The smart pavement sensors in the IDS send runway surface condition data to the collection system, called MetConsole. It reduces the communications infrastructure required, which in turn lowers operational costs. MetConsole software manages all Automated Weather Observing



Systems (AWOSs) and other aviation weather applications at Brussels Airport, for example. "IDS is a software module that runs in the MetConsole system," said Block. "We added this software to give all the pavement information and then provide a separate set of screens and diagnostic tools for airport operators."

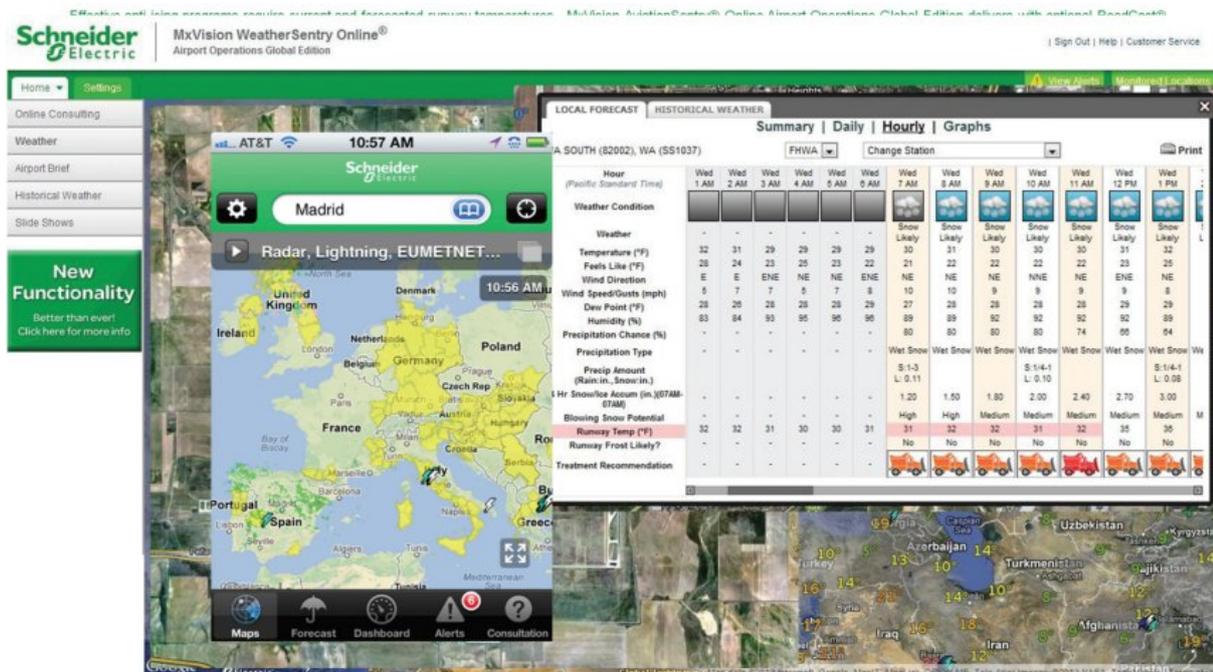
Belgocontrol began to apply IDS in 2011. "It took a couple of years to install it and debug it," he acknowledged. "We had to do a lot of testing to be sure that all sensors work with all systems installed at the airport."

In Brussels, the sensors are in place on the threshold of the runway, so over time they turned black from the rubber of aircraft tyres passing over them. "It actually caused a lot of problems," said Block. "Belgocontrol has to go out there and clean it up once every week or so to remove that tyre rubber build-up. The sensors were great and survived, even with 15 B-747's landing on them every day. They continued to operate just fine."

Forecast service

The next step was to combine the basic IDS with weather forecast data. In the United States, Schneider Electric's Weather Services Group has a global online subscription weather service for airport operators, called AviationSentry Online (ASO). Currently, ASO supports operations at 75 US airports.

"We can use information from real-time sensors to generate real-time forecasts," said Block. "We forecast not only atmospheric weather but also pavement temperatures. We can use the actual temperature of the pavement, which we get from the IDS. ASO generates a 24-hour forecast of what these temperatures are likely to be."



Schneider Electric's weather forecasting service supports operations at 75 airports in the United States. (Schneider Electric)

1520321



The display incorporates all current weather information, so airport staff can see current and forecast weather on one screen. "We take all of the runway data and add in the current and forecast weather conditions," said the managing director. "Then we apply technology, originally developed at the National Center for Atmospheric Research in the US, to produce a forecast of both atmospheric and runway conditions. Then we look at the actual orders, called Rules of Practice, which a customer like Belgocontrol has. When a forecast calls for some amount of snow for one or two hours, you treat it as recommended by the Rules of Practice in the IDS system."

The system calculates this automatically, and shows it on the display for operators to take action. Airfield operations staff are not confined to a seat in front of a computer - they can be out on the runway, with the confidence that the system will alert them via smartphone or tablet PC up to 12 hours before runway treatment is needed. The system only delivers an alert if the runway temperature drops below 0°C. The pavement temperatures are always forecast 24 hours, but the hourly forecast runs for 72 hours and there is a daily forecast that goes out for 15 days.

Accurate real-time and forecast data derived from IDS could help airport operators allocate resources and personnel more efficiently, as it is expensive to retain runway staff on standby. "The idea behind this is that it provides efficiency; it maximises your takeoff and landing operations and minimises your costs, crew costs, chemical costs and your environmental costs," Block concluded. "You bring more functionality to an airport's infrastructure."



Pavement sensors at Brussels airport, after two years of use in the runway touchdown zone, are covered in a layer of rubber from aircraft tyres - but they continue to operate normally. (Schneider Electric)

1520323

The full IDS system, including the forecasting component, is in operation at Brussels Airport. MetConsole is in use at four Belgian airports plus Amsterdam Schiphol and Luxembourg airports. "It is now being installed at all 16 international airports in Germany," Block added.

Airports in the United States use the active and passive IDS sensors and the ASO forecast service - but not MetConsole. This is "because the FAA just uses its self-developed and certified software apps", Block explained. "We are talking with a number of airports in northern Europe about this system. The biggest thing is installing the sensors in the runway pavements, so this takes a few months. The most important piece is the IDS system itself, before you can have forecasts."

Copyright © IHS Global Limited, 2015