



WINTER OPERATIONS

Daily operations within an airport are complex and stressful on a regular basis. However, when the winter season hits, snow, ice and other dangerous conditions can make running an airport a formidable task.

Here, four different airports from across the globe tell us how they battle the challenges winter brings.



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Battling low visibility, strong winds and fog

Christchurch International Airport rarely gets more than a light dusting of snow, however, as *Tim Morris*, Manager Airfield Operations, details, the airport must face other extremes during New Zealand's winters.

CHRIStCHURCH Airport is the gateway to New Zealand's South Island and the second largest airport in the country, welcoming approximately seven million passengers a year.

In winter, our biggest challenge is not snow. Over the past five years, only small amounts have fallen. Instead, our biggest winter challenge is managing flights diverted here from airports snowed under. Network interruptions can mean us having to accommodate planes that we weren't expecting.

Our own winter challenges are low visibility, strong winds, big storms, frosts and fog. Christchurch Airport has developed relationships with meteorological agencies who provide up-to-date information to show what's coming, and we work with airlines to consider what to prepare for.

Preparing for winter in Christchurch

In the first week of May each year, the airport company hosts a winter preparedness exercise, coordinated by Airfield Operations Support Manager, Robyn Weir.

"We have a formal Snow Plan document, and we test all emergency preparation and processes outlined. The exercise involves multiple internal and external businesses and agencies and is based in

our Emergency Operations Centre (EOC).

"We spontaneously rehearse our response to whichever event is announced as we arrive at the EOC, thinking laterally and quickly about how to keep the airport operating as well and for as long as possible. The exercise is a valuable refresher for established staff, inducts new staff and has a range of businesses across the campus working together on an event which really could happen."

Our snow-clearing equipment is on the airfield during the exercise, refreshing and retraining drivers, recertifying the equipment, refining tactics and updating procedures.

Our weather patterns are definitely changing, but not just in winter. We are recording more extremes, with hotter summers and more mild winters, alongside bigger rain and wind events. What used to be described as 'once-in-50-year events' are now more regular, and we learn from each one.

The largest natural event we learned from in recent times was the 2011-12 sequence of earthquakes, which damaged our central city and claimed 185 lives. Though the airport was not damaged, it came under significant pressure as the entry point to a crippled city which rescuers wanted to enter and visitors wanted to leave. As a result of more than 10,000 aftershocks, we learned a lot about emergency



TIM MORRIS has worked for Christchurch International Airport Ltd since 1996, currently in the role of Manager Airfield Operations. During these 23 years he has held seven different roles across the business and has worked in, or with, all the company's different operational teams. His current portfolio includes responsibility for the airport fire service, wildlife management, airfield and apron operations, integrated operations centre and emergency management.



Our own winter weather challenges are low visibility, strong winds, big storms, frosts and fog ”

responses and ourselves, and have been able to share what we learned with organisations across the country, and world. Our highly-trained and competent team was tested and lauded in equal measure and grew as more people from across the business volunteered for training.

Winter operations can be costly for an airport and if we were to receive a heavy or sustained snow event or were forced to close for a day or two, the impacts would be felt across the city, island and country. South Island producers, for example, rely on daily flights to Asia and Europe to get their prime produce to overseas markets in the shortest time and best condition.

Keeping the environment in mind

Over the past 10 years, we have managed to maintain some form of operation even on difficult days, but making things happen can present their own difficulties. For example, de-icing aircraft comes at a cost to airlines, has an impact upon schedules and can present environmental issues, especially in regard to our airfield which sits above the city's drinking water aquifer.

Kaitiaki, or guardianship, of our environment is one of the pillars of our company's strategy, so all aspects of our winter operations consider sustainability a priority. We have extensively researched products, and only use ones we are confident will have no – or minimal – impact on our surroundings.

We focus on managing icy conditions around the airport, to keep visitors safe, including using inhibitor products to stop ice forming. A typical mid-winter day might be a heavy frost followed by a fine day, repeated the next day and possibly the next.

In these winter conditions we must stop ice forming on runways. Snow and rain are more easily dealt with, but once snow melts and then freezes, it takes a lot of work to clear the runway to a dry usable form. We have equipment and dedicated staff trained and ready for those tasks, but in heavy snow the battle can be to keep areas clear long enough for an aircraft to arrive or depart. When clearance efforts cannot keep up with the weather, major decisions about operational viability must be made. Closing is the last thing airports ever want to do, so we at Christchurch consider ourselves fortunate that such events are rare.

Watching and evaluating the weather is part of our daily operation. It perhaps goes without saying that it is vital for us to do all we can to avoid adverse weather, especially in winter, spoiling what might be the overseas experience of a lifetime. ✉

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Whatever the weather

Keflavik International Airport is Iceland's gateway, but, as **Throstur Soring**, Director of Airport Operations, identifies, the tough climate zone that surrounds the airport means they must be well prepared for adverse weather, always.

SNOWFALL, ice and strong winds frequently create hurdles for Keflavik Airport's operations during winter. But it is not the amount of snowfall that is challenging, but the unfavourable combination of snow, temperature fluctuations near freezing and winds.

Snow clearing preparedness requires continuous work around the clock, simultaneously on runways and the apron. Our winter organisation consists of approximately 100 people divided into four shifts and teams. When heavy or prolonged snowfall is forecasted, we mobilise additional resources from our passenger transport division where several bus drivers are trained for snow work. The fleet consists of 11 runway sweepers, nine loaders, four snow-blowers, a grader and six chemical or grit spreaders.

To accommodate the 100 per cent rise in daily movements at Keflavik Airport from 93 in 2014 to 186 in 2018, the apron has been expanded; increasing the area for snow-clearing action by 34 per cent – a challenge for the snow team.

Accumulated annual snowfall in Keflavik may differ considerably between years, ranging from 1,500mm to 5,000mm over the last five winters. Snowfall is the dominating factor concerning expenses to winter service, with the total working hours for the snow fleet being proportional to snowfall. However, the use of chemicals and grit are less dependent on the annual snowfall, due to different weather conditions claiming different strategies.



THROSTUR SORING

is the Director of Airport Operations at Keflavik International Airport. Soring is a civil engineer that has specialised in airport management and design and has been with Isavia since 2013. Before joining Isavia, Soring worked for the Icelandic Civil Aviation Aerodrome Department for three years.

During continuous snowfall occurring at the busiest hour, the apron team may be directed from stand to stand to avoid disruptions and provide just-in-time treatment of stands for optimum safety. Due to snow compaction on the surface during ground handling and de-icing of aircraft on stands, ice may build up on the apron, rendering anti-icing chemical treatment useless. In those cases, we grit the surface and critical spots on the taxiways.

Frequent shift in wind direction calls upon good collaboration between the snow team and ATC, as the crossing runways often must be treated consecutively. Flight diversions due to runway conditions are rare, as the runway snow clearing takes less than eight minutes. We don't close the runway during snow operations, it is merely a rhythmic process orchestrated by the 'snow-king' and ATC, when aircraft movements are synchronised with regular clearing runs. Occasional low-visibility conditions associated with snow-blizzards may from time to time lead to occasional holding positions, or in rare cases pilots may have to divert.

The maritime climate presents frequent temperature fluctuations around the freezing point. For this, state-of-the-art weather and runway sensors are in place. To facilitate preventive anti-icing treatment, a runway temperature and icing prognosis system has been developed. The aim is to apply chemicals to the movement area punctually before freezing sets in, for increased treatment efficiency and safety. However, chemical use is a challenging task

“*Measurements suggest that the frequency of storms has increased, and the number of freeze-thaw cycles is going up*”

due to snow drifting in our windy environment, as the concentration of active substance is diluted when snow drifts onto the treated surface. Our experienced team leaders evaluate the situation continuously to decide the appropriate action.

The airport is subject to strict pollution control. For anti-icing chemicals we use biodegradable formates with low-oxygen demand, considerably reducing the risk of adverse effects. A groundwater surveillance programme is in place, where chemical content is regularly monitored in observation wells around the airport. As a member of the Airport Carbon Accreditation initiative, Isavia committed to offset all carbon emissions from the company's operations by supporting wetland reclamation in Iceland.

The Weather Safety Committee issues warnings and ensures coherent action among stakeholders during adverse weather with rules for bad weather. Whenever required, stakeholders are called in for arrangement of a relevant action plan. Weather extremes demanding special attention and preparedness include occasional extreme snowfall, freezing rain and storms. Our aim is to minimise disruptions in operations whilst putting safety first. For improved planning purposes, we have access to a custom weather forecast where chosen weather parameters are highlighted once

their value reaches a predefined trigger value. For example, high wind gusts may limit or prohibit the use of passenger boarding bridges at the terminal. Every winter, passenger boarding bridges must be shut down on a few occasions due to wind gust. Such closures last on average for just over an hour. To minimise disruptions to apron operations due to wind, we installed numerous wind anemometers which analyse the wind pattern. Real-time monitoring and analysis of sensor data together with computer simulations of wind flow, enables us to locate favourable positions for aircraft handling in different weather situations, thereby reducing downtime and maintaining safety.

The weather in Iceland has always been known to be harsh, fluctuating and unpredictable. Over the last few years, measurements suggest that the frequency of storms has increased, and the number of freeze-thaw cycles is going up. Onset of winter is later, and spring comes earlier: On average, the snowy season starts late October or early November and lasts until March or April. However, experience tells us that snow ploughing is to be expected in September and as late as May. In statistical terms, it is therefore too early to pinpoint the possible effects of climate change on Keflavik Airport, but we are prepared for future challenges, whatever the weather. ❏



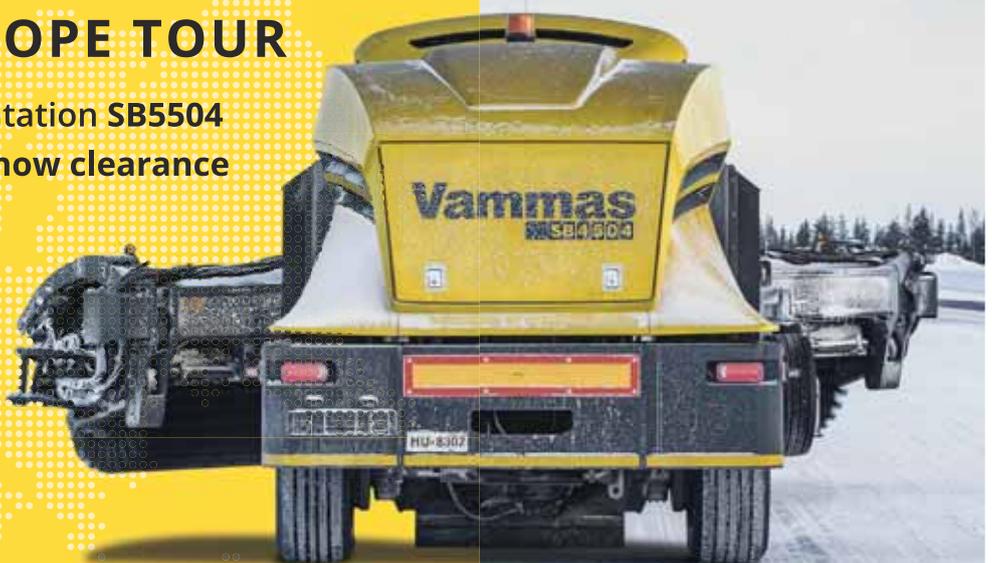
The maritime climate presents frequent temperature fluctuations around the freezing point, demanding high awareness in weather monitoring

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Unpredictable weather requires reliable procedures

To ensure flight frequency is maintained during the winter season, Moscow Domodedovo Airport employs special technologies and measures across its operations. International Airport Review spoke to the airport to find out what can combat -54°C.

AT MOSCOW DOMODEDOVO AIRPORT, during winter we often encounter snow, rain and ice: The main hindrances of transportation systems. When the first frost comes, it is imperative that we take care of our runways, roads and safeguard aircraft safety.

Traditionally New Year holidays are the busiest times at Russian airports. Passenger traffic almost doubles compared to usual everyday operations. For instance, on 29 December 2018, Moscow Domodedovo Airport handled 87,000 passengers; half the average monthly traffic figures during the winter. But during this period, weather conditions can pose challenges for airfield services. For example, in January 2017, severe frosts gripped Moscow and it was the coldest Orthodox Christmas in the country for 120 years, with thermometers reading -30°C overnight. To maintain flight frequency and aircraft safety, Moscow Domodedovo Airport developed special technologies and procedures to ensure seamless passenger experiences despite weather conditions.

Preparation is the key to success

Every year, Moscow Domodedovo Airport starts planning for the following autumn-winter period as soon as the current one has passed. We maintain our special machines and restock de-icing and anti-ice fluids as well as chemical agents. Temperatures in Russia can drop dramatically in winter, so our custom vehicles run on Arctic diesel which is designed to withstand temperatures as low as -54°C.

Moreover, we conduct seasonal training for our staff to improve their skills in accident prevention on a regular basis. We seek to invest in employee training and education, ensuring both partner airlines and passenger comfort are at the forefront of everyone's mind. We have built a training base to allow the practice of innovative approaches to anti-/de-icing. We are confident that experience is the top priority in developing efficient de-icing procedures and ensuring aircraft safety in the



© Alexey Prihodko

autumn-winter period. We actively participate in a wide range of conferences and workshops to master discipline-specific skills and techniques. We are glad to show our technologies and exchange knowledge with a wide audience. For instance, in January 2018, Moscow Domodedovo Airport organised a special event for press, demonstrating how it handles more than 500 flights per day even during the heaviest snowfall. In 2019, together with Federal State Unitary Enterprise 'State ATM Corporation', we conducted a press tour exploring the work of an air traffic control officer under severe weather conditions.

De-icing/anti-icing procedures

In 2018, Moscow Domodedovo Airport didn't experience periods of massive delays and cancellations thanks to the procedures we have in place. However, technical delays of up to 20 minutes are possible in the winter period due to severe weather conditions. These delays arise from the necessity to complete de-icing procedures and clear ice and snow from runways and taxiways. De-icing is an essential process in aircraft safety as both snow and ice alter the aerodynamic shape of the wing and tail, changing their ability to create lift and increasing drag.

De-icing/anti-icing is a procedure geared to protecting aircraft from ice on the ground. The treatment itself may be performed in one or two steps with various types of fluid. Usually de-icing fluids are dyed different colours to aid application and identification on aircraft surfaces. Type I fluids are orange in colour while Type IV fluids are green.

We carry out a one-step de-icing/anti-icing process, employing a Type I heated fluid to remove frozen contamination. The one-step procedure protects treated aircraft surfaces for up to 45 minutes when no precipitation is falling. However, if precipitation occurs, the holdover time will run out after a few minutes.

We perform a two-step de-icing/anti-icing procedure using Type I heated fluid to remove frozen contamination to begin with. In addition, we can employ Type I pre-diluted heated fluid for preliminary handling to remove large amounts of frozen contamination. This trick allows us to lower fluid consumption. We carry out the second step

before the first-step fluid freezes. At this stage, we apply cold thickened Type IV fluid to ensure longer anti-icing protection lasting tens of minutes amidst moderate snow.

Take-off preparations and holdover time

We perform anti-icing as near to the departure time as operationally possible, utilising a maximum holdover time. To accelerate the process, we employ several de-icing trucks to carry out procedures in designated areas close to a runway.

The holdover time varies depending on a wide range of factors including weather conditions, procedure and fluid types, and aircraft type. Usually, crews rely on special tables to define holdover time. However, due to the many variables impacting holdover time, the actual time of protection may be extended or reduced depending upon the certain conditions prevailing at the time. Prior to take-off the pilot in command should calculate whether the applied holdover time is still appropriate.

Relying on modern technology

The airport possesses custom machines for handling aircraft, ramps, runways and other airport surfaces during snowfalls. Moscow Domodedovo Airport has 22 aircraft de-icing vehicles, including unique custom vehicles such as Vestergaard's Elephant Beta and Elephant Beta-15 as well as Safeaero's SDI 218.

We use 60 custom machines to maintain the airfield in the cold. These winter service vehicles include snow blowers, motor graders for removing packed snow and chemical spreaders. Two Wausau TURBO BLAST 500 cold-air blowers remove snow and ice from side row lights on runways and taxiways. These vehicles are the most powerful air blowers and are commonly used in Canada and the United States, however in Russia it is only Moscow Domodedovo Airport that employs the machine.

Moscow Domodedovo Airport performs de-icing procedures for all types of aircraft. The Elephant Beta-15 Delcer has a specially designed boom system that lifts the spraying nozzle to more than 24m in height, minimises application time and reduces movement around the aircraft. This is incredibly helpful when de-icing the world's biggest passenger aircraft: The Airbus A380. ▶



ABOVE: Temperatures in Moscow can drop to as low as -54°C during the winter season. Photo credit: Alexey Prihodko

“ We cannot change the winter weather. But we can change the way we perceive the season. ”

Moscow Domodedovo Airport resorts to precautionary anti-icing/de-icing chemicals to deal with ice on runways and taxiways. In cold weather, we use two types of agents to cover artificial turf at the airfield and adjacent areas: Liquid for icing prevention and granules for removing ice crust from surfaces.

“ The only thing we can rely on in unpredictable winter weather are our staff, our vehicles and our procedures ”

Seeking to enhance ecological responsibility and sustainability, Moscow Domodedovo Airport strives to reduce the environmental impact of its winter operations. For instance, we created separate spaces near runway thresholds to perform de-icing procedures. Moreover, we have launched a wastewater treatment system for both storm water and industrial effluents.

Future growth plans

Moscow Domodedovo Airport machinery permits several de-icers to handle aircraft with engines running. De-icing spaces stand on both sides of Runway 1 reducing handling time and accelerating take-off preparations. Domodedovo was the first to establish de-icing spaces near the runway in Russia and among the CIS countries.

In March 2017, Moscow Domodedovo Airport completed a large-scale modernisation programme of its Resource Management System (RMS).

This information system schedules airport resources in real time; managing parking slots, check-in desks, departure gates and dividing duties among employees.

We equipped our ground handling staff with more than 1,500 mobile devices. These gadgets automatically receive flight details and keep track of tasks to carry out during pre-flight preparations. We linked all devices to the HUB Control, an integral part of Moscow Domodedovo Airport’s information system, gathering and monitoring data about task status. Furthermore, the service calculates aircraft readiness to take off in real time and accelerates ground handling to maintain flight frequency.

Winter is just a season. At Moscow Domodedovo Airport we know for sure that severe weather conditions are a fact of life. We understand all too well that we cannot change the weather. But we can change the way we perceive this season and face these challenges with as much preparation as possible. Thus, we seek to ensure (in advance) that we have restocked de-icing and anti-icing fluids as well as maintained our custom vehicles. The only thing we can rely on in unpredictable winter weather are our staff, our vehicles and our procedures. ✉

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EXPERT PANEL

Within our Winter Operations In-Depth Focus, *International Airport Review*, asked a panel: **“What is the best advice you can give to an airport in regard to how to prepare for the winter season?”**

PARTICIPANTS



LARS BARSOE

VP Sales & Marketing, Vestergaard



GARY LYDIATE

Chief Executive, Kilfrost



ADRIAN SYNORADZKI,

Export West Director, Vammas Airport Equipment

LARS BARSOE: Have a plan! Do a lot of training and execute the plan. This sounds like easy and simple advice, but it really does come down to planning. This is valid for both airport ground management teams and ground handling companies. The plans are different, but the need is the same.

When it comes to aircraft de-icing, where Vestergaard Company is a specialist, plans must be in place for the location, and who will perform the duty. Operating instructions must be written, and crews hired and trained prior to winter. Equipment must be in place and maintained, so that it is ready the first day it is needed. De-icing fluid must also be in place.

A good system must exist for channelling orders from captains to de-icing crews: They must be well trained, and the coordinator must know how and who to dispatch where. With all of the above in place, you have a chance of success.

GARY LYDIATE: At this time of year the aviation industry reflects on the prior winter months as preparations are made for the upcoming cold season. During 2017/18, we experienced a UK winter characterised by intensely cold periods, and airport infrastructure struggled to cope. Compare that with the winter just gone and we got off lightly – our operations coped well, and we were able to take the opportunity to assist other airports with their winter operations.

Lessons have been learnt and airports are welcoming measures to prevent aircraft de-icing fluids running low – avoiding disrupting aircraft movement.

Kilfrost's history goes back to the development of fluids during World War II, and the introduction of radiator anti-freeze used by Antarctica expeditions. Our scientists are pioneers of fluid innovation, boasting a number of world firsts across the industry.

We are also working closely with our customers and invite key stakeholders to information-sharing

forums. Kilfrost has been instrumental in the coordinated initiative between SAE International, IATA and ICAO, which has resulted in the creation of three new SAE Aerospace Standard (AS) documents referring to global aircraft ground de-icing.

I would urge all industry stakeholders to continue to share experiences, further raise standards and increase knowledge-sharing around winter preparedness and the application, handling and storage of aviation fluids. It is only through cooperation that we can progress and improve.

ADRIAN SYNORADZKI: Despite temperatures rising, winter still causes many challenges. At airports, departure frequency, which is several dozen seconds during summer time, increases to 1.5 hours on average during snowfall.

Before each departure, vehicles must remove snow from the runway; Vammas specialises in technology that enables this.

Refuelling of aircraft, loading and unloading luggage, catering, technical controls and de-icing are examples of airside infrastructure requirements. But these operations happen outside and unfavourable conditions can significantly slow down implementation. Our safety concerns cannot be limited to passengers, they must consider staff too. That is why our equipment is fully operated from an operator's cabin, equipped with several sensors and protections that ensure a zone of high-quality safety.

In all of this, equipment reliability – designed and configured for the needs of a specific aerodrome – is imperative. After the season, training, simulations, upgrades, exchange of ideas and experiences occur: Fighting with winter lasts a full year.

This has been successfully implemented by Vammas for over 70 years in the iciest regions of the world. ❌

A line of yellow snowplows is parked on a snowy runway at dusk. The runway is covered in snow with visible tire tracks. The sky is a deep blue, and the plows have their headlights on. The overall scene is cold and industrial.

How does Helsinki Airport weather the storm?

In Finland, there is nothing exceptional about harsh winter conditions. With snow typically covering the Helsinki region for almost a third of the year, we need to overcome the challenges of the constantly changing winter weather, explains *Kimmo Mäki*, President and Chief Executive Officer of Finavia.



“ It's not the amount of snow itself that airport maintenance struggles with, but temperature ”

YEAR-ROUND air traffic at Helsinki Airport is only possible thanks to comprehensive snow know-how, or, 'snowhow'. We even have a saying in our work community that, for our runway maintenance, winter lasts 12 months a year. This means that, in order to be successful, winter maintenance skills must be sustained even through the warmer months.

What helps in developing our snowhow at Finavia is analysis of the previous winter and planning for the winter ahead. Right after the winter season, our maintenance teams look at how they can improve their operations in the future, and before the following winter season, staff will undergo training to maintain and develop their expertise.

Throughout the year, our simple aim is to keep runways in a state similar to those in summer. In that sense, on our runways, summer also lasts 12 months a year.

Always prepared, always informed

Snow and ice have the potential to impair the friction of runway surfaces, so our maintenance and air traffic control staff keep a constant eye on weather forecasts.

All of our runways are equipped with high-tech sensors that monitor tiny changes in the tarmac temperature, both on the surface and underneath it, constantly.

This allows us to predict weather conditions six to eight hours in advance. Weather sensors and forecasts become more sensitive by the year, which leads to better timed winter maintenance.

Contrary to what people might think, it's not the amount of snow itself that airport maintenance struggles with, but temperature. We are particularly interested in temperature changes around zero centigrade, as this is the trickiest temperature from an air-traffic-safety point of view.

When weather conditions are close to freezing, but there isn't much snow, runways are at risk of

freezing over. Early winter, from November to the beginning of December, tends to be the trickiest time for us in this respect.

Measuring friction regularly is essential for safety, and information on tarmac friction is fed directly to traffic control, who, together with the pilot, decide whether it's safe to land.

An army of sweepers and blowers

When snow does begin to fall, our army of industrial-scale snowploughs, sweepers and snowblowers is ready for action. Helsinki Airport has three runways, and with our equipment it takes only 11 minutes to clean one of them of snow. When one of the runways is being cleaned, the other two can still be fully functioning, which ensures that air traffic can continue normally.

Typically, there are one or two occasions per winter when strong side winds force us to close two of the three runways at the same time. If the one remaining runway needs to be cleared of snow during this time, there can be delays in traffic. However, Helsinki Airport has never had to be closed due to a snowstorm.

This is thanks to the over 100 employees who operate the snow-clearance vehicles and equipment on the runways and apron as well as other ground traffic areas. The maintenance units are on call 24 hours a day, and when a harsh spell is in sight, extra staff can be called in.

Finavia's strategic snow clearance fleet at Helsinki Airport includes 60 vehicles and other equipment. The fleet is maintained by our own repair shop, and we are also able to produce spare parts when needed.

Along with the manufacturers, we have been developing an efficient brush-blower vehicle suitable for use on runways. After decades of product development, the current model is 25m long, weighs 32 tonnes and is able to plough an area of up to nine metres in width. ▶



KIMMO MÄKI, President and CEO has been employed by Finavia since 2018, and is responsible for ensuring that the company's operations are in accordance with the law and financial administration has been organised in a reliable matter. The CEO chairs the Executive Group and Board of Directors on Finavia's major subsidiaries.

It is an impressive sight to see a total of nine of these 32-tonne monsters driving side-by-side on the three-kilometre long, 60m-wide runway. We have about 26 different brushing patterns to choose from, each selected on the basis of departing and arriving traffic flight directions.

Snowbanks forming on the runway edges are then lowered using snowblowers with four-wheel steering and over 1,000hp. We can't allow the snowbanks to grow too high, as aircraft could come into contact with them.

Furthermore, our icebreaker will dismantle ice around the parking areas to prevent the apron from being too slippery. As a result, we can actually reduce the use of chemicals when clearing ice.

“ For our runway maintenance, winter lasts 12 months a year ”

Winter conditions spark innovation

Finavia has received international attention during several winters, due to the reliability of Helsinki Airport, even in harsh snow conditions.

Efficient snow removal and smooth operations require not only powerful machines, but also procedures that have been honed to perfection over the years. Our maintenance team, for example, has over 20 procedures that have been designed and practiced in advance and can be applied in collaboration with air traffic control whenever weather conditions demand it.

The harsh winters also encourage innovations, many of which have developed from practical needs, such as a service car that uses an internal lift to improve the process of changing runway lights.

In the Finnish winter, it can become uncomfortable to take off one's gloves out in the open. But, a bulb on the airport runway cannot be changed with gloves on, as its parts are so small.

Some years ago, our team's electricians solved this problem. They came up with the idea of an opening underneath a service car, and a lift with which they can descend directly onto runway lights.

In the shelter of the lift and the car, an electrician can change lights without getting their hands cold.

There are even cameras at the back of the car and above the opening that help to park the car right above the light. These cars and equipment cannot be bought commercially, so they are customised according to Finavia and its maintenance teams' needs.

Minimising environmental impacts

Although mechanical methods such as sweeping and ploughing are the primary methods for clearing snow off runways, sometimes we have to resort to chemical de-icing agents for proactive skid prevention and to remove frost and ice from the runway surface.

Anti-icing and de-icing treatments are also performed on aircraft to ensure their manoeuvrability and performance. De-icing and anti-icing treatment is mainly performed during cold seasons, under freezing conditions and is occasionally needed in late spring and early autumn.

To reduce the environmental impacts of winter operations, we use formate-based agents to prevent skidding. They readily decompose and contain no nitrogen.

Helsinki Airport recovers glycol-containing water and snow at the apron. This is carried out by letting the water to wastewater sewage or by using specialised equipment, suction vehicles and snow-gathering vehicles that have been specially developed for these operations. The glycol-contaminated runoffs collected at the airport are then processed by the municipal water treatment works.

We have also constructed and reconditioned de-icing and anti-icing stations where agents can be more efficiently collected. Overall, we invested a total of €74 million in de-icing areas between 2010 and 2018.

As a result, the pollution load caused by anti-icing treatment agents on the aquatic environment has significantly decreased since the turn of the millennium. The nitrogen pollution load has almost entirely ceased, and the oxygen consumption load has decreased by so much that in some years, it's only a third of what it used to be in the early 1990s.

Thanks to better management of glycol-containing waters and the fact that aircraft de-icing and anti-icing operations are now concentrated in designated areas, the water quality has improved so much that endangered sea trout have returned to spawn in the Kylmäoja stream running on the eastern side of the airport.

Finavia is currently expanding Helsinki Airport to serve growing passenger volumes, and our runway and apron area will also be renewed. Keeping our snowhow skills up to date will remain just as essential in the future. ✕

