



Sustainable taxiing and the Taxibot

What's the thinking behind sustainable taxiing?

Royal Schiphol Group's ambition is to operate the world's most sustainable airports. One of our main goals is for Amsterdam Airport Schiphol to be an emission-free airport by 2030. Schiphol is working hard to achieve this, not least by making its ground operations more sustainable. Sustainable taxiing is fully expected to be part of this shift.

That's why Schiphol is currently engaged in a feasibility study into sustainable taxiing. A key component of this study is the Taxibot pilot project, launched in the spring of 2020.

At present, aircraft use their own engines when they taxi to and from the runway. This results in emissions of CO₂, NO_x and fine and ultrafine particulate matter. Aircraft can taxi more sustainably by relying on another power source – in this case the Taxibot – instead of their own engine power. This saves kerosene and lowers emissions.

Sustainable taxiing can contribute to the reduction of both CO₂ and nitrogen. The pilot project is therefore one of the measures included in the Sustainable Aviation Agreement, a document that sets out collective climate measures designed to reduce the emissions caused by the aviation sector.



What does Schiphol hope to discover?

The aim of the pilot project at Schiphol is to find out more about the following topics:

- the contribution sustainable taxiing makes towards reducing emissions. Aircraft taking off from Schiphol taxi for an average of 14 minutes, and inbound aircraft for an average of 9 minutes. Taxiing times at Schiphol are relatively long due to the distance between the terminals and the Polderbaan Runway. This makes Schiphol the ideal airport to test the environmental impact of sustainable taxiing.
- the effects on safety and operations. Is it possible for Schiphol to slot sustainable taxiing neatly into its operations? Can this be done on a large scale and, if so, how? A whole range of factors need to be considered, from developing the necessary procedures and the impact on the workload of various stakeholders (e.g. air traffic control) to constructing the necessary infrastructure.
- the nature of any problems that might arise in the field of policy and regulation. What kind of policy interventions are needed to achieve upscaling and implementation?

How does the sustainable taxiing pilot project work?

An aircraft normally taxis to and from the runway using its own engines. During the pilot project, a number of aircraft will be towed to and from their take-off and landing positions by the Taxibot. This towing vehicle is powered by a hybrid combination of electric and diesel engines, and consumes 95% less fuel during taxiing than an aircraft's engines.

How does the Taxibot work?

The Taxibot looks like a normal pushback truck, the vehicle that pushes aircraft backwards from the gate to the taxiway and then disconnects. The Taxibot takes the aircraft further, remaining attached until it is in position at the runway. This enables the aircraft to start its engines much later.



The Taxibot has four-wheel steering, which makes it highly flexible. It can both turn on its axis and drive sideways. The Taxibot connects to the aircraft in such a way that the pilot can steer it with the nose wheel, and the Taxibot's flexibility ensures that it follows the movements of the nose wheel exactly.

Why do you need a special Taxibot?

The Taxibot may look like your average pushback truck, but technically it is far more advanced. If you tried to use a pushback truck to tow a fully loaded aircraft, the force required could end up damaging the nose wheel. There is no such danger with the Taxibot. In addition, the Taxibot can tow at higher speeds and cover greater distances than a normal pushback truck.

Which aircraft are involved in Schiphol's pilot project?

The pilot project at Schiphol is using Boeing 737s that belong to Corendon Dutch Airlines, KLM and Transavia. The Boeing 737 is the type of plane most airlines use when flying into and out of Schiphol. In addition to the Boeing 737, the Taxibot is certified for use with the Airbus A320. The Taxibot does not yet have the capability to handle other types, for example wide-body aircraft, but a larger model is currently being developed for this purpose.

What does Schiphol expect from the project?

Because engines have to warm up for a several minutes prior to take-off, Schiphol expects to achieve a total saving of between 50% and 85% in fuel consumption while taxiing. This represents a considerable reduction in CO2 emissions. It will also contribute to a healthier living environment: the reduced emission of fine and ultrafine particulate matter and nitrogen will improve air quality, while curtailing engine use will reduce noise pollution.

Do other airports use a Taxibot?

There are currently ten Taxibots worldwide. Three are operational in India: two in Delhi and one in Bangalore. In India, the initiative is being led by a consortium of parties, with the approval of the airports.

Who developed the Taxibot?

The Taxibot was developed by Smart Airport Systems, a sister company of ground-handling equipment supplier TLD.

Who is Schiphol working with?

Schiphol is running this trial in conjunction with Air Traffic Control the Netherlands, the Dutch Ministry of Infrastructure and Water Management, Corendon Dutch Airlines, KLM, EasyJet, Transavia, dnata and KLM Ground Services.

What comes next?

The feasibility study is scheduled for completion in the autumn of 2020. By then Schiphol hopes to have reached a positive conclusion with its partners on the feasibility, sustainability and scalability of sustainable taxiing.

If the outcome is positive, the project can enter its next phase, which will include drawing up an implementation plan. It is important to realise that the introduction of sustainable taxiing is not a short-term solution. It will be several years before the technology is sufficiently advanced and suitable for every type of aircraft.

If the study shows that sustainable taxiing is feasible, and the project gains the support of policymakers in the aviation sector and the political arena, Schiphol expects to implement sustainable taxiing on a large scale around 2030.

Would you like to know more about the sustainable future of aviation?

Visit: [schiphol.nl/sustainablefuture](https://www.schiphol.nl/sustainablefuture)



Facts & Figures

- The Taxibot is powered by a hybrid of electric and diesel engines
- Average outbound taxi time (departure): 14 minutes
- Average inbound taxi time (arrival): 9 minutes
- Longest taxi time (Polderbaan Runway): 20 minutes on average
- Aircraft engine warm-up time: 2-7 minutes, depending on factors such as outside temperature and engine type
- In addition to warming-up, there is also a cooling-down time of at least 3 minutes
- A Boeing 737 or Airbus A320 engine consumes approx. 6-8 kilos of fuel a minute while taxiing
- The Taxibot can reduce fuel consumption during taxiing by 50-85%
- One kilo of fuel produces 2.5 kilos of CO₂ emissions
- The Taxibot is currently certified for the Boeing 737 and the Airbus A320
- The Boeing 737 and Airbus A320 account for 54% of flights at Amsterdam Airport Schiphol