

"TiTANO®AIR" – An innovative coating concept for improved and long-lasting hygiene on board

Summary

Aircrafts are places where thousands of people meet in a very confined space. This situation enables the spreading of diseases from person to person, and in consequence around the world. Airlines and industry suppliers are attempting to reassure passengers and staff that aircraft cabins are as safe as possible during the COVID-19 crisis in a variety of ways, from mask policies to individually branded cleaning programs, from barrier shielding to changed inflight service, from physical distancing to the use of long-lasting cleaning products.

A new strategy is presented by Lufthansa Technik and HECOSOL GmbH that aims to reduce the surviving of different germs on high touch areas during more than one year after only one application. The advantage of the presented TiTANO®AIR technology is that it may be administered easily and at any time to airplanes as well as to other highly sensitive areas in airports. No light is necessary for activation and the application is fully safe for the operator. A significant germ reduction of 65% in a Eurowings A319 has been proven.

Introduction

In the modern world it became more and more usual to travel by plane, either for business or holiday reasons. In the year 2019 4.54 billion passengers were carried around the world by the aviation industry. This means an increase of 3.6% compared to 2018. In addition to that it has to be considered that the 15 biggest airports handle ca. 35% of all passengers. In average this is equivalent to approximately 211.000 passengers per day or roughly 8.800 passengers per hour. This high density of passengers is not only a challenge for the technical logistics along the boarding processes but as well a challenge for the cleaning procedures.

Hygiene risk assessment

Considering the fact that every single passenger hosts its own microbiome with >1.000.000.000.000 bacteria it turns out to be clear that surfaces in highly populated rooms are colonized by a high number of germs as well.

The surfaces with the highest contamination are the following:

- lavatory flush button
- tray table
- overhead bins
- seat belt buckle & aisles
- seatback pockets, safety instruction leaflet
- galleys
- others

Investigations proved that germs are not only shortterm residents but are able to populate surfaces for several days:

Classification	Species	Location	Survival (days)
Bacteria	E. coli	armrests	4
		tray table	3
		steel toilet handle	2
	MRSA	tray table, armrest, toilet flush handle, window shade, seat cover & pocket	2 - 8
Fungi	Aspergillus	tray table, armrest, textile & leather seats	>7
Virus	COVID-19	metal & plastique surfaces	2 - 9
	Influenza A	close to seat pocket	2 - 3
	Norovirus	various surfaces	7

Among the investigated germs are so called nosocomial germs like *Escherichia coli* and *MRSA (methicilline resistant staphylococcus aureus)* that are connected to infections acquired in hospitals. In addition, fungi like *aspergillus* and viruses like *norovirus* are found on various surfaces like seating areas.

Especially with view on the spreading of viruses it could be proven that the world air network is an excellent basis for modelling the global pandemic spreading of diseases such as SARS (2003), Influenza A (2009), MERS (2012), Ebola (2013), H7N9 (2016/17), and SARS-CoV-2 (since 10/2019).

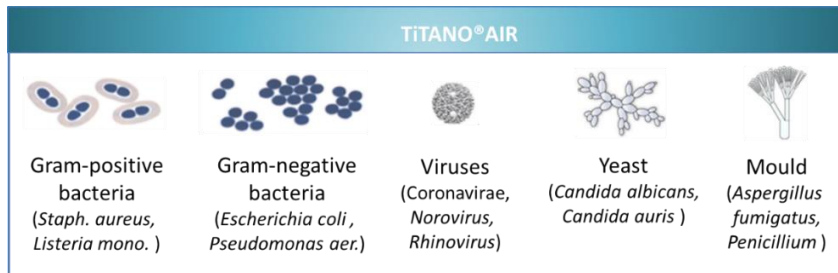
The risk assessment for a healthy person with an intact immune system might be considered as low during a flight. But there are individual factors that weaken the immune status like stress, jet lag or alcoholic consume. Among the travellers are as well immuno-compromized, sick or elder people. Further, there are technical impacts like the environmental control system (ECS) reducing the room humidity down to 20% (normal humidity: 45 – 55%) and the cabin temperatures <20°C. In combination with climate and geographical changes (warm, cold, humid, dry), the flight duration has a negative impact on the well-being of each passenger too. In addition to that, hygiene protocols vary between low price and high-quality airlines. Facing a high competition situation, most of the Airlines are pushed to cut costs and to reduce the standing time on the airfield. In consequence, this may lead to dramatically reduced cleaning times.

How to reduce the infection risk?

The microbiological findings on the survival of germs on normally unpopulated surfaces clearly indicates how important it is to apply the airplane to regular cleaning and disinfection procedures between arrival and departure. If these procedures are skipped due to commercial reasons, the germ concentration will increase with the next boarding. In consequence the infection risk for passengers will increase too. Therefore, it would be reasonable to introduce an additional functionality on surfaces that permantly eliminates germs and stops them from growing. These so called „antimicrobial surfaces“ should be seen in context with the general cleaning procedures and a consequent hand disinfection of passengers and staff with the goal of lowering the infection risk.



The TiTANO®AIR surface treatment from HECOSOL® is an antimicrobial technology that might be applied as aquatic suspension to all types of solid surfaces and textiles in the cabin. With the electrospray technique, it can be administered quickly to relevant surfaces in the aircraft cabin. The dry coating reduces a broad variety of germs **independent of the light and climate conditions** for 24/7:



In laboratory tests, TiTANO®AIR shows a strong efficacy of up to 99,999% against various bacteria, as well as non-enveloped viruses, yeasts and mould. Corona virus is eliminated on coated surfaces by a factor of 5 faster compared to non-treated surfaces.

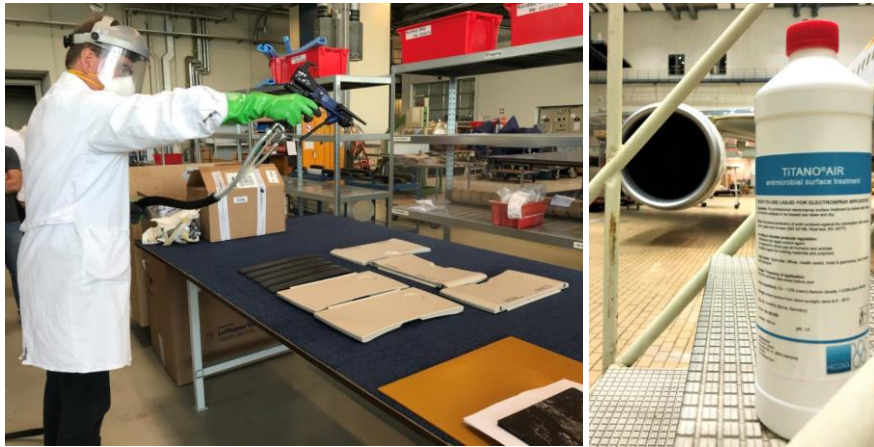
After coating a Eurowings A319 with TiTANO®AIR, the Hamburg Port Health Center has proven a mean germ reduction of 65%:

<p>Toiletten-Spülknopf</p> <ul style="list-style-type: none"> • vorne & hinten <p>erreichte Keimreduktion - 28% to - 44%</p>	<p>Gepäckablage (links)</p> <ul style="list-style-type: none"> • Reihe 9/12/14 <p>erreichte Keimreduktion - 73% to - 91%</p>	<p>Klapptisch innen (links)</p> <ul style="list-style-type: none"> • Reihe 9/12/14 <p>erreichte Keimreduktion - 63% to - 71%</p>
<p>=> TiTANO® Air führt zu einer signifikanten Keimreduktion von 65% in der Innenkabine!</p> <p style="text-align: right;"> Lufthansa Technik</p>		

Combined abrasion-efficacy tests under dry and wet conditions predict a **stability of the coating for at least one year**. Tests with coated textiles do not indicate any harmful or allergic potential for the human skin (DIN EN ISO10993-5).

With these properties TiTANO®AIR is more efficacious than competitor products that have to be applied every week or every 3 months by spraying or wiping!

Since April 2020 Lufthansa Technik has done a manifold of investigations like plastic crazing test, sandwich corrosion, flammability test per EASA CS25853 (a) and (d) Amendment 23 (12 sec. vertical and 60 sec. vertical flame exposure).



All tests led to **positive results** and thus Lufthansa Technik could reach a **certification** by an EB-SC, applicable to most commercial aircrafts. Since October 2020 Lufthansa Technik targets the application of TiTANO® AIR within commercial, private and governmental aviation industry (747, 767, 787).

