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Kansai International Airport:
countering A/H1N1 influenza

Kansai International Airport spray the handles of baggage trolleys with SUNECOATE TASK produced by Sakon Creation Co. Ltd.

Kansai International Airport, which started its service in 1994, is the first Japanese airport to operate 24 hours per day, serving as both a destination in its own right, with associated easy access to/from downtown, and as a transit point to other domestic and overseas locations. With a round-the-clock operation, it was important to ensure that noise pollution was kept to a minimum and such environmental concerns were part and parcel of the airport's mission from the onset. The last year has, however, seen a new threat to world travellers – that of A/H1N1 influenza, otherwise known as swine flu. Rather than distance itself from any responsibility for the spread of the disease, Kansai International Airport has recognised that any public place can facilitate contamination and transmission and, as such, it has taken steps to protect airport customers from the latest bio hazard to concern air travellers and has, in the process, become a model of social responsibility.

Kansai International Airport views its role as being a contributor to people's mutual understanding of different cultures and traditions and sets out to use travel and its specific role as a gateway for trade and tourism to foster peace and prosperity in the world and, more specifically, to encourage cultural exchanges that link Japan to Asia and destinations further afield.

The airport is operational 24/7, utilises multiple 4,000-metre runways and is located offshore in order to help preserve the natural environment. It offers an extensive network of international (serving 67 cities in 27 countries and regions in the winter of 2009) and domestic (serving 10 cities in Japan as of this October) routes. Furthermore, Kansai International is easily accessed by railway, limousine, bus and even a high-speed ferry.

Realisation of Airport Safety

We consider our customers' safety within the airport as our first priority and the ultimate service we can provide them. Therefore, we take extreme measures to ensure the airport operates in a safe environment, whilst taking countermeasures to try and prevent disasters, either naturally occurring or man-made, and having well rehearsed contingency plans should, despite our best efforts, an emergency occur.

With the aim of preventing incidents and accidents, our Safety Management System (SMS) has been in operation since January 2008 to enhance safety. The Aerodrome Safety Management Committee, established by KIAC as an in-house organisation, is responsible for taking measures to continually improve safety before an accident occurs by actively auditing operations and taking corrective action after the tiniest of incidents, in addition to conventional post-facto handlings. The Executive Vice President of KIAC is the President of the Aerodrome Safety Management Committee, whilst the President of KIAC is the supervisor of the SMS.

To handle aerodrome safety management as a body, the Aerodrome Committee has, since September 2008, been comprised of airport management as well as air traffic control, airlines and handling agencies, amongst other airport organisations. Discussions take place on developing concrete safety measures and information proliferation processes at the monthly Safety Information Sub-committee.

Maintenance of Facilities

Our facilities - runways, passenger terminal building, fuel farms - are all under continuous scrutiny to ensure that the airport operates securely and smoothly.

For instance, if an incident occurs in the fuelling facilities, aircraft departure delays or, of greater concern, fuel leaks, with their resulting fire or sea pollution potential, may arise. That is why we inspect the facilities on a daily basis and react on the spot should any issue be identified.

Regular maintenance works are carried out in slots when no interference with the airport's normal operation is predicted. With the airport now being 15 years old, facilities are being renewed bit by bit, always considering the balance between necessity and the cost of renewal. Repairs to taxiways, the renewal of the disaster prevention system in the passenger terminal building and the aviation lighting monitoring system for runways are all current projects.

The runways are used throughout the night because of the airport's round-the-clock operations, with mid-night cargo flights and acting as an emergency divert location. Whilst one runway was being refurbished, maintenance slots were limited to three times per week, three hours at a time. Following the opening of the second runway in August 2007, we commenced repairs on the first runway; the repair works were completed in August 2008 and it is now being used perfectly safely again.

Preparation for Earthquakes

Many sections of the roads within the airport are elevated. Earthquake-proof reinforcement work against the Hanshin-Awaji class (magnitude 7.3) of earthquake commenced on all such roads in October 2006 and was completed by October 2008. Nowadays, even if an earthquake occurs and physical signs appear on the road surfaces, serious damage is minimal and, as a result, not only is passengers' safety achieved but road usage by emergency vehicles is ensured.

In 2008, we introduced a flashing earthquake warning system in the passenger terminal building and in the car parks. A signal of an earthquake's estimated intensity is provided automatically when a quake exceeding magnitude 4.9 around the airport is forecast and warning announcements are made in Japanese, English, Chinese and Korean.

Aircraft accident training excercise at Kansai International Airport

Kansai Counter-Breach Training

Countermeasures Against Subsidence

As the airport is built on reclaimed land, subsequent soil movement has been predicted since the airport's opening; this might cause negative structural and functional impact to the 1700 metre long passenger terminal building. So, to secure the building, subsidence monitors are in place to constantly observe, predict and correct any problem before it becomes serious. All of the terminal's 900 pillars can be adjusted vertically using jacks to counter-balance any earth movement.

Reinforcement of Security

With regards to airport security, the Central Security & Anti-disaster Control Centre monitors the entire airport through the use of many CCTV and intrusion detection sensors, supplemented by a communication network. In 2008, we reconfigured the communication networks between the various organisations concerned with emergency response.

As for passenger security checks, in-line screening has been in place for baggage checks of international departing passengers, to standards recognised by the TSA and ECAC, since October 2007. It is our plan to adopt in-line screening for domestic passengers in April 2010.

Countermeasures Against Emergencies

The Crisis Management Committee, under the direction of the President of Kansai International Airport, was established to prevent and respond to serious incidents such as air crashes and hijackings; this committee exists in addition to the regular Airport Security Committee.

In November 2008, a training exercise was effected in which a vehicle attempted

Anti-viral Mechanism by Photo-catalyst

by Hirotaka Naitou Ph.D., Institute for Environmental Sciences, University of Shizuoka

Metallic oxides such as strontium titanate (SrTiO3), tungsten trioxide (WO3) and zinc oxide (ZnO), as well as sulfides such as zinc sulfide (ZnS) and cadmium sulfide (CdS), are known as photo-catalysts.

On grounds of its photo-catalytic properties, stability and safety, it is titanium dioxide (TiO2) that is generally utilised as a photo-catalyst. It has long been understood that TiO2 absorbs ultraviolet rays to catalyse chemical reactions. The photo-catalytic property of TiO2 was reported by Fujishima and Honda in 1972, and the use of UVA activated TiO2 for disinfection was proposed by Matsunaga et al. in 1985. There have since been reports of the use of photo-catalysis for the destruction of bacteria, fungi and algae.

The effect on the destruction of a virus (bacteriophage) by photo-catalytic reaction was first reported by Sjogren and Sierka in 1994. More recently, the effect of the photo-catalytic reaction on many kinds of viruses has been reported (eg. Ling et al. 2007).

Understanding of the antibacterial/antiviral effects of photo-catalyst requires some chemical knowledge. When light is irradiated onto TiO2, electrons are excited due to photoelectric effect and electrons and holes are generated. The excited electrons bind to molecular oxygen in the air to form a highly chemically reactive species. On the other hand, positively-charged holes react with water in the air to form a highly chemically reactive species. These highly reactive species oxidatively decompose organic matters including proteins and lipids, exerting antibacterial and antiviral effects. However, TiO2 requires ultraviolet rays in order to generate reactive oxygen species. Although ultraviolet intensity equivalent to that outdoors is enough, the amount of ultraviolet rays emitted by indoor fluorescent lights may not be sufficient in some circumstances, hence taking a long time for antibacterial or antiviral effects to be exhibited. For the purpose of achieving these effects even under dim lights, therefore, photo-catalysts carrying antimicrobial metals such as copper and silver are being utilised at present.

Bacteria are unicellular organisms, whose structural components are mostly proteins. Consisting also of proteins, the toxins that bacteria secrete can be decomposed through oxidation by reactive oxygen species in a way similar to bacteria themselves. A virus is a simple microorganism in which genetic material (DNA or RNA) is encapsulated by the capsid protein. The viral outer membrane and the spike to infect the host cell are also proteins. Photo-catalyst oxidatively decomposes the organic matter of the virus and eliminates its activity. Reactive oxygen species decompose or destruct any organic matters regardless of whether they are bacteria, virus, or dust.

The influenza virus can survive on environmental surfaces and can infect a person for 2 to 8 hours after being deposited on the surface.(Centers for Disease Control and Prevention http://www.cdc.gov/h1n1flu/qa.htm) Viruses can be transmitted from hands to inanimate surfaces and vice versa (Ansari et al. 1988, 1991) and contaminated surfaces are implicated in the transmission of viruses (Widdowson et al. 2005). Photo-catalyst is film-coated on the object and exerts its antiviral effect by contacting the surface. Therefore, it is very effective for such cases where a small amount of the target matter is adhered to the surface.

to force its way into the airport's restricted area; an outcome was the further development of the mobile barricade and 'vehicle intercept angle' concept designed to aid emergency vehicles intercept such an intrusion attempt.

In addition to training exercises and programme development that respond to such security incidents and other safety-related occurrences, from serious aircraft crashes at or in the vicinity of the airport through to comparatively minor passenger ailments, we have also enhanced our disaster prevention patrols and improved the level the level of fire awareness and countermeasures guidance we provide to the restaurants and shops in the passenger terminal building.

Countermeasures Against Infectious Diseases

In the event of the emergence of a serious infectious disease overseas, a special centre, directed by the President of KIAC, is established in accordance with our own action plan and the guidelines issued by the government.

When A/H1N1 influenza broke out in April 2009, KIAC worked in cooperation with the government's quarantine officials in order to continue to provide a smooth transportation service to our customers whilst also ensuring that border controls limited the potential spread of the virus within Japan.

We developed a temporary facility to screen inbound passengers in order to identify infected persons. We also provided information staff in the quarantine halls and, through them and the public address system and notice boards, we encouraged residents and visitors to wear masks and wash their hands frequently; we further directed employees to wear masks when commuting to and from work.

However, one area in which Kansai has been an international trail-blazer and has lead the way in countering the anticipated increase in A/H1N1 influenza infection rates this winter, is in its pro-active measures in preventing the spread of the virus within the airport as a result of passenger and staff contact with contaminated surfaces. In September, we painted on a special coating of an anti-virus solution to all surfaces where human contact is the norm.

The solution is an eco-friendly high-performance technology using a specialised photo-catalyst coating (called SUNECOATE TASK and produced by Sakon Creation Co. Ltd.) and Kansai was the first airport in Japan to use the substance. It was applied to the handle bars of approximately 2,300 baggage carts and the buttons in around 50 elevators, as well as to 500 door panels in lavatories, nurseries, first-aid rooms and the counters of information desks.

The cleaning solution contains a catalyst, titanium dioxide, which produces surface oxidisation to eliminate harmful substances such as organic compounds, viruses or bacteria when exposed to the sun or a fluorescent lamp.

Unlike cleaning products, the solution is applied once and it is only if the surface is scratched that it becomes ineffective and, even then, only on the specific location of the scratch. As a result, our baggage carts, elevator buttons, doors and surfaces are highly unlikely to retain and transmit the A/H1N1 virus...which is exactly what we aim to ensure as we protect the passengers and staff that utilise Kansai International Airport. ■

Kansai International Airport sprays the urinals (Top) and counters (Left) with SUNECOATE TASK produced by Sakon Creation Co. Ltd. to counter the A/H1N1 virus.