59th CONFERENCE OF DIRECTORS GENERAL OF CIVIL AVIATION ASIA AND PACIFIC REGIONS

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AGENDA ITEM 7: ENVIRONMENT

INNOVATIVE AIRPORT SUSTAINABILITY: ACHIEVING 100% WASTEWATER RECYCLING

(Presented by the Republic of Korea)

SUMMARY

The Republic of Korea (ROK) has implemented a Graywater Facility at Incheon International Airport to address water scarcity and promote environmental sustainability by recycling wastewater from its terminals. This facility processes up to 30,000 m³/day using biological, physical, and chemical treatments, converting 100% of the wastewater into usable graywater with an effective usage rate of 60%.

This initiative has conserved water resources, reduced environmental pollution, and improved public perception of the airport's sustainability efforts. Future plans include capacity expansion and technological upgrades to enhance treatment efficiency and sustainability. The Graywater Facility directly supports ICAO's Long-Term Aspirational Goals (LTAG) and aligns with UN Sustainable Development Goals (SDGs) by promoting sustainable practices and reducing the environmental impact of aviation operations.

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1. INTRODUCTION

1.1 The aviation industry faces a growing imperative to adopt sustainable practices. As global air traffic increases, so does the environmental impact of airport operations, particularly concerning water use and wastewater management. These challenges are further exacerbated by constrained resources, making it essential to find innovative solutions that address both environmental sustainability and resource efficiency.

1.2 The Republic of Korea (ROK) has implemented a Graywater Facility at Incheon International Airport to address water scarcity and promote environmental preservation. The facility reprocesses wastewater from the airport's passenger terminals and auxiliary buildings, converting it into usable graywater for various non-potable applications. This working paper highlights the innovative approach taken by the ROK through its Graywater Facility, emphasizing the role of advanced water recycling systems in promoting airport sustainability and supporting ICAO's Long-Term Aspirational Goals (LTAG) and UN Sustainable Development Goals (SDGs).

Relevance to LTAG & UN SDGs

1.3 The Graywater Facility directly supports ICAO's LTAG by promoting sustainable practices and reducing the environmental impact of aviation operations. By recycling water, the facility reduces the airport's reliance on external water sources and decreases wastewater discharge, contributing to overall resource efficiency and environmental conservation. This initiative also supports the UN SDG 6 (Clean Water and Sanitation) and SDG 13 (Climate Action), reinforcing global sustainability efforts.

2. DISCUSSION

Objectives

2.1 The primary objectives of the Graywater Facility are threefold. Firstly, it aims to protect surrounding coastal ecosystems by significantly reducing the amount of wastewater discharged into these environments. Secondly, the facility seeks to recycle water within the airport, thereby reducing the airport's dependence on external water supplies. This is crucial for water conservation and resource management, particularly in the context of constrained resources. Thirdly, maintaining high standards of water quality and treatment efficiency is a key operational goal, ensuring that the recycled water meets all necessary safety and quality criteria for its intended non-potable uses. This directly aligns with UN SDG 6 goals of water conservation and management.

Facility Overview

2.2 The Graywater Facility operates with a designed capacity of 30,000 cubic meters of water per day. This capacity can be expanded in the future as demand increases. The facility uses a combination of biological, physical, and chemical treatments to purify wastewater. Specifically, 50% of the treatment involves biological processes using a Modified Sequencing Batch Reactor (MSBR) technology, which is effective in removing organic matter and nutrients. Another 30% of the treatment process involves physical methods, such as sand and granular activated carbon (GAC) filtration, to remove particulate matter. The remaining 20% involves chemical treatments to further enhance water quality, using minimal chemical additives.

Treatment Process

2.3 The treatment process at the Graywater Facility is comprehensive and multi-staged. It begins with screening, where large debris and grit are removed from the wastewater. The water then moves to an equalizing basin, where the flow and load are stabilized to prepare it for further treatment.

In the bioreactor stage, organic pollutants are biologically degraded. This is followed by filtration, which uses sand and GAC to remove any remaining impurities. The final stage is disinfection, where chlorination ensures that the treated water is free of pathogens and safe for non-potable use.

Operational Performance and Benefits

2.4 Since its opening in 2001, the Graywater Facility has treated approximately 83 million tons of wastewater. Of this, 100% has been converted into usable graywater, with around 50 million tons actually utilized, achieving an effective usage rate of about 60%. Economically, the facility has generated significant benefits, saving approximately $109 million in sewage treatment fees and generating $32 million in revenues from the sale of graywater. This results in a total economic impact of $141 million. Environmentally, the facility has played a crucial role in conserving water resources and reducing pollution. Socially, it has enhanced public perception of the airport's commitment to sustainability. These outcomes contribute to UN SDG 13 (Climate Action) by addressing water resource management and reducing environmental footprints.

Conclusion

2.5 The Graywater Facility at Incheon International Airport exemplifies a forward-thinking approach to sustainable airport operations. Through investments in advanced water recycling technologies, the Republic of Korea has significantly reduced its environmental footprint, achieved cost savings, and set a benchmark for sustainability in the aviation industry. This initiative aligns with global efforts to enhance environmental stewardship in aviation, supporting ICAO's LTAG and the UN Sustainable Development Goals (SDGs) to ensure a greener future for air travel.

2.6 Despite its success, several challenges remain. Scalability is a key issue—adapting the technology for use in airports of varying sizes and water demands. Public acceptance of recycled water for non-potable uses also poses a challenge, requiring effective communication and stakeholder engagement. Additionally, regulatory compliance is a significant concern, as different regions and States have varying standards for water quality.

2.7 Future plans for the facility include expanding capacity and upgrading technology to enhance treatment efficiency and sustainability. By addressing these challenges and continuing to innovate, the Graywater Facility can serve as a model for airports worldwide, demonstrating the critical role of water recycling in achieving sustainable aviation operations.

3. ACTION BY THE CONFERENCE

3.1 The Conference is invited to:

a) Encourage Member States and industries worldwide to engage in collective efforts to adopt advanced water recycling systems in airports, recognizing their crucial role in reducing environmental impact and promoting sustainable growth in the aviation industry;

b) Recommend ICAO take a leading role in facilitating the implementation of water recycling as part of efforts to address environmental impacts in airport operations, in consultation with Member States, industry stakeholders, and subject matter experts, to ensure that strategies are both practical and effective; and

c) Recognize that this collaborative effort will enhance environmental sustainability, support overall efficiency, and improve the cost-effectiveness of airport operations by safeguarding natural resources, reducing operational costs, and maintaining the integrity of airport infrastructures through the proactive adoption of water recycling technologies.

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